

Contractors and Engineers Monthly

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PICKS and SHOVELS

By O. E. POTTER

What? No "Hooch"?

Some of the joys and griefs of the contractor for the widening of the Livingstone Channel in the Detroit River between the Canadian and Detroit shores were described by W. J. McHenry in a recent issue of the *du Pont Magazine*. The most disappointing experience, to the workmen at least, came when one of the long cofferdams was unwatered to permit dry excavation.

Back in the days before Repeal, this section was said to have been on the route of rum-runners who smuggled liquor from Canada, making from one to six round trips every 24 hours. So it was believed that when this section was dried up, plenty of whiskey, wine and beer of the F. O. B. variety (flung overboard), dumped by the rum-runners when the Law was too hot on their trail, would be revealed.

However, when the river bottom within the cofferdam was exposed, the eager expectations of the workmen were shattered. We are told that only a few bottles of liquor and some cases of beer were recovered. What a blow!

The Moral Is

There was a dirt moving contractor To whom cost was never a factor.

He bid just below

Where he thought it would go

So now he's greasing a tractor.

—The Earth Mover

Penny Ante and Morale

"You boys have got to quit playing penny ante around this job. You are sent out here by the Welfare Department because you are up against it and need work. I'm not going to let you gamble away what you are earning," exploded a well-meaning Superintendent on a PWA job. For a week or so after the ban on penny ante, the men were out-of-sorts during the noon lay-off and at other times when there were

(Continued on page 23)

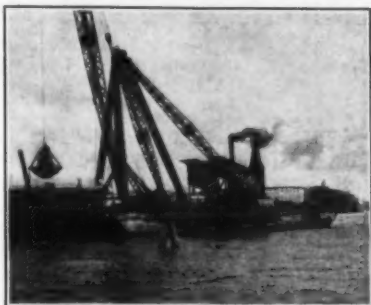
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Apalachicola Bay Bridge

5-Mile Bridge and Causeway New Florida Road Link

(Photo on page 44)



C. & E. M. Photo

Clamming Out One of the Caissons at Pier 4 Before Pouring the Tremie Seal

Highway Program for 1935-36 Assured

Hayden - Cartwright Amendment Preserves Contract System and Assures Continuance of Federal Aid for Roads

WITH the passage of the Emergency Relief Bill, carrying the Hayden-Cartwright Amendment, the largest Federal appropriation for highways in history has been authorized. Federal and state appropriations for highways for 1935 and 1936 will total \$1,355,000,000, according to a statement from the American Road Builders' Association.

The earmarked national funds for highways, streets and grade-crossing elimination, together with the funds already authorized under the Hayden-Cartwright Act of last year, amount to \$1,005,000,000. If the states match the Federal Aid already authorized, it will add \$250,000,000 more to the highway program, or a grand total of \$1,255,000,000. Also there will be available the state money used for highways outside of that used for matching Federal Aid, estimated at \$100,000,000.

Provisions of Act

This new highway legislation continues the apportionment of the highway funds to the states in accordance with the Hayden-Cartwright Act. The apportionments for grade-crossing elimination funds are in proportion to the mileage of highways, mileage of railroads and population. It provides for the expenditures of these funds by state highway departments under the Federal Highway Act of November 9, 1921, as amended, and the Hayden-Cartwright Act of June 18, 1934. No part of the funds need be matched by the states.

It also provides that the funds shall be spent under rules and regulations prescribed by the President, which undoubtedly will be similar to the rules and regulations under the Hayden-Cartwright Act.

Preference in employment of labor shall be given to persons receiving relief, except those in executive, administrative, supervisory and highly skilled positions. The President is authorized

(Continued on page 33)

THE new 5-mile combined bridge and causeway being built by the State Road Department of Florida as PWA Project 843, across Apalachicola Bay, is a much-needed link in the chain of surfaced roads built in this section by the State during the last six years. It will also be an important link in the Gulf Highway extending from Galveston, Texas, through Louisiana, Mississippi, Alabama, and on to Pensacola, Fla., thence through Fort Walton, Fla., Panama City, Apalachicola, Tallahassee and down the west coast of Florida.

For many years a private company provided inadequate ferry service across the Bay. Within the last two years the State has operated a free ferry over the same route but still with long waits for through traffic. The bridge will eliminate all this and provide a sea-going causeway longer than that connecting Galveston Island with the mainland. The city of Apalachicola will benefit greatly by the improved traffic link as, with the beautiful drive on either side of that city, traffic is bound to be increased. The next important city to the west is 65 miles away and to the east, 74 miles.

Five Contracts for Project

The work is divided into five separate contracts, three of which will furnish the subjects of the four articles in this series: the concrete piers for the main river span; the causeway formed by hydraulic dredging; the bridge sections on composite pile bents; and the floating concrete mixing plant and the casting yard for the 20 miles of concrete hand-rail. From the Apalachicola or

Hardaway Contrg. Co. Built Concrete Piers for River Crossing with Floating Plant

western end of the bridge the work is divided as follows:

Embankment Approach.....	494.51 feet
Main River Crossing and Swing Span.....	2,589.81 feet
Causeway Embankment.....	5,999.56 feet
Pile Trestle with Concrete Deck.....	3,800.44 feet
Causeway Embankment.....	2,999.56 feet
Pile Trestle with Concrete Deck.....	9,394.71 feet
Embankment to Shore.....	2,005.51 feet
Grading of East Bay Approach.....	7,800.00 feet
Total Length of Contracts.....	34,284.10 feet

The contractors for the various sections of the work and their bids were as follows: Duval Engineering & Contracting Co., hydraulic embankment and bulkhead protection, \$222,550.61; Hardaway Contracting Co., all concrete piers for the main river crossing, \$137,336.20; Doullut & Ewin, all trestle pile driving, concrete deck and hand-rails, \$681,748.19; Nashville Bridge Co., steel superstructure for the swing span of the main river bridge, \$73,979.10; Penton-Mathis Construction Co., grading the approach at the east end of the bridge, \$14,224.34. The total cost of above PWA contracts, exclusive of engineering, is \$1,129,838.44.

Construction of Concrete Piers

The concrete piers consist of two legs tied by concrete beams at about mid-height and at the top but with separate foundations and footings. In this contract there were nine piers and a swing span of 285 feet with a 1,500-foot pile trestle approach.

The pier footings measure 11 feet x 13 feet 6 inches neat for each leg and

(Continued on page 15)

WIDENING A HEAVILY-TRAVELED TEXAS HIGHWAY



C. & E. M. Photo

Truck-Mixed Concrete Hauled 5 Miles for Beaumont Project. See page 8

Aggregate Production and Concrete Handling on Bonneville Project

By HENRY W. YOUNG

(Photo on page 44)

BONNEVILLE PWA Project, on the Columbia River near Portland, Ore., aside from railroad and highway relocations, is being handled in two main contracts. One includes the power house substructure and navigation locks between Bradford Island and the Oregon shore; the other is the spillway dam between the Island and the Washington shore. The latter has progressed to the point where the cofferdams are being unwatered and excavation started.

The power house substructure and locks are now well ahead of schedule. The present article deals with that part of the undertaking, outlining the methods used in the production and storage of concrete aggregates and cement, together with the mixing and placing of the concrete. The plant and equipment were designed for this phase of the work.

A birdseye view of the situation is this: sand and gravel are dredged from the Willamette River at the outskirts of Portland by two dredges and fine sand is secured by a third dredge from the mouth of a slough near the Columbia River. The materials are barged to the production plant built for the purpose on the Willamette in the city of Portland, where the oversize is crushed and all aggregates washed and classified. They are then shipped by railroad approximately 40 miles to the site, in 60-car trains.

Concrete aggregates go into open storage on Bradford Island. The cement, also coming in by train, goes into a steel silo. Cement, sand and gravel meet at the batching plant located on the brow of the cliff overlooking the power house excavation. The mixed concrete is transported by locomotive and dump car to a loading dock immediately under the cableway, and thence by bucket to the forms.

Portland Production Plant

This plant was built by the General Construction Co. The materials are unloaded from the barges by a Williams 5-yard clamshell bucket, on a 120-foot boom, delivering to a bin over the grizzly in the case of the Willamette materials, and a separate bin for the Columbia River sand.

Four and one-half inch oversize from the grizzly is passed through a Wheeling 10 x 36-inch jaw crusher. The crushed materials are returned to the barge and again pass to the grizzly. Fines pass by way of a Stephens-Adamson apron feeder to a Link-Belt bucket elevator, 12 x 24 inches, and then to a

Clean River Aggregates Hauled by Rail to Dam and Mixed by Plant with Automatic Control

Telsmith revolving screen, 5 x 14 feet. This takes out 3-inch and 1½-inch sizes which go to bins.

Oversize from the revolving screen passes a 3-foot Symons cone crusher and thence, by a 10 x 20-inch Link-Belt bucket elevator to a 3 x 8-foot Allis-Chalmers 3-deck vibrating screen. This delivers ¾-inch, 1½-inch and 3-inch materials to their respective bins.

The three grades of materials are then passed through Telsmith radial gates to a 30-inch belt conveyor built by the H. W. Sharp Co. of Portland. The fine Columbia River sand from its bin also passes through the radial gates to this conveyor. From it the materials are fed to a Stephens-Adamson swing belt conveyor delivering to cars along side. Dodge-Timken bearings and Republic Rubber Co. belt are used in all conveyors.

Handling the Fines

Going back to the Telsmith revolving screen, the fines from it first come to two 3 x 8-foot Stephens-Adamson double-deck vibrating screens. The output of these screens is minus ¾-inch to ¼-inch, fines, and plus ¾-inch to ¼-inch. The latter goes over to the ¾-inch bin in the first line, while the first is delivered direct to cars or to storage as desired, leaving the fines, which go to a Perkins revolving classifier.

Mud and silt from the classifier go to waste while the materials of ¼-inch mesh go to a bin and thence by a Telsmith radial gate to a 30-inch H. W. Sharp belt conveyor, to a Stephens-Adamson swing belt conveyor, and to cars. This part of the installation is a duplicate of the part described above.

Wash water is secured by a Byron-Jackson deep-well pump driven by a General Electric turbine type motor. This water is introduced just before the Telsmith revolving screen and also at the double-deck vibrating screens.

The normal capacity of this plant is one 60-car train per 24 hours.

Power Equipment, Apparatus	Portland Production Plant	Drive
Williams Bucket	150 hp hoist	
Jaw crusher	40 hp swing	
Apron feeder	10 hp	Dodge V-belt
Bucket elevator (12x24)	50 hp	Baldwin chain
Revolving screen	25 hp	Turbo
Cone crusher	75 hp	Gates V-belt
Bucket elevator (10x10)	40 hp (Falk gear)	Rockwood
3 deck screen	75 hp	Baldwin chain
2 double-deck screens	75 hp ea.	Turbo
30-inch belt conveyors	25 hp (Falk gear)	Baldwin chain
Swing belt conveyors	30 hp (Falk gear)	Baldwin chain
	75 hp ea. (Falk gear)	Turbo

All motors are Allis-Chalmers



Locomotive and Double Dump Car for Transporting Concrete to the Loading Platform

Aggregate Storage at Bonneville

The aggregates go onto a 16,000-cubic yard open storage area on Bradford Island. In connection with it is a materials handling plant designed by H. W. Sharp of Portland, who, in conjunction with the Balzer Machinery Co. of that city, furnished all the equipment for the batching plant. The capacity is 250 cubic yards of materials per hour.

Sand and gravel are lifted 80 feet, by a bucket elevator, from a one-car capacity track hopper to a 30-inch inclined cross conveyor 75 feet long, delivering to another 30-inch conveyor 451 feet long over a storage tunnel. Discharge to pile is by means of a 30-inch Dodge tripper.

(Continued on page 10)

Stabilized Roads a Real Job

Care and Thought Needed for Proper Building of This Type of Low-Cost Road

By H. G. SOURS, County Engineer, Summit County, Akron, Ohio

THERE are probably as many varied types of low-cost construction as there are of the high types and the proper exercise of engineering ingenuity and judgment in selecting the right type, considering requirements and costs, is just as important in this field, as it is in the field of high types. The stabilized traffic-bound type of secondary road is not suitable to cover the entire field of secondary improvements any more than any one type of hard surface is suitable under all conditions, but there is a field in which it fits.

Definitions

The stabilized road is simply defined as one made up of a graded combination of fine and coarse aggregates proportioned so as to permit the minimum amount of displacement of the component particles after once in place, cemented together with the proper amount of clay which acts as a binding agent. The resistance of the coarse and fine particles to sliding over each other is known as internal friction; sharp, angular and to some extent flat materials have a higher factor of internal friction than round and will make a more stable mix.

(Continued on page 17)

Pumping Highway Fill for Widening Job

(Photos on page 44)

TRAFFIC has increased so rapidly on U.S. 90, the nation's thoroughfare from New Orleans east to Florida, since the new free bridges were opened by the State of Louisiana a few years ago that the existing 20-foot roadway proved inadequate and work is now underway to widen it to 41 feet. The original embankment was thrown up by clamshell and dipper dredges from borrow pits on either side of the center line. On May 5, 1934, Wilbanks & Pierce, Inc., of New Orleans was awarded the contract for delivering about 2,200,000 cubic yards of dredged fill to these old borrow pits to widen the existing fill, after the material had dried out, by pulling it in and up with draglines.

Two small dredges, the Illinois and the Grizzly, were first used on this work. As soon as the new dredge Manatee was completed she was put onto the work and on June 15, 1934 started delivering from 10,000 to 12,000 cubic yards of material, dry measurement, to the pits each 24 hours through a pipe line varying from 800 to 3,500 feet long. The contract required that the dredge work only from the Lake Catherine side and that no material be dredged closer than 250 feet to the shore. When the dredge worked in the marsh it was required to work at least 700 feet from the center line of the highway. The material varied from mostly fine sand to stiff pipe clay, but the two smaller dredges worked in large areas of mucky clay. The material in all cases dried out readily in a few days and by the time the fills were completed, handled perfectly by dragline.

The Pipe Line

The discharge pipe of the dredge was

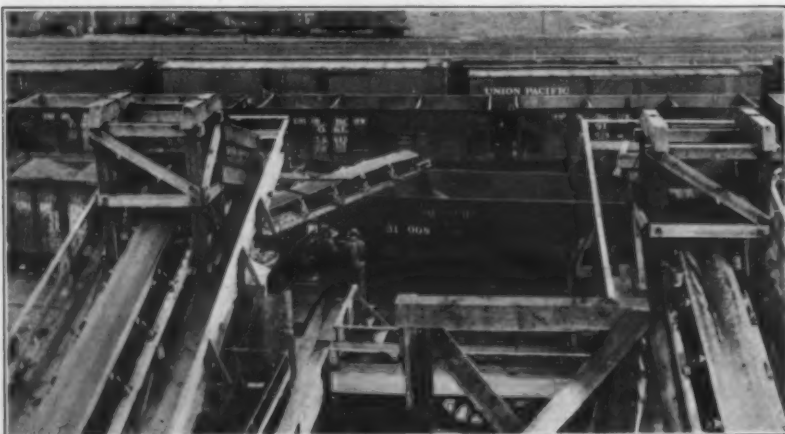
The Dredge Manatee Handled 12,000 Yards of Earth Every 24 Hours on Louisiana Project

18 inches in diameter and the minimum length was 700 feet plus the pontoon line of from 100 to 1,000 feet. The longest length of line used was about 3,500 feet with no appreciable diminution in the output of the dredge which was not pushed to its limit on this contract. The individual pipe lengths varied from 12 to 16 feet. The pressure in the pipe line varied from 35 to 85 pounds.

Inasmuch as all the dredging had to be done on one side of the road and the borrow pits on both sides had to be filled, the pipe line had to be carried across the roadway. Continuous pumping and continuous heavy traffic created a problem that required careful study to prevent interruption of the work. The Superintendent designed a bridge to carry traffic over the pipe line where it crossed the roadway and flattened one of the pipe sections to about 14 inches so that it would require less rise in the bridge. When pressure was put on the pipe and there was no heavy truck on the bridge the pipe resumed its circular cross section and lifted the bridge. This was overcome by raising the center of the bridge to permit the pipe to have its proper clearance.

The bridge was well-built and sufficiently strong to carry the heavy truck and bus traffic which uses this thoroughfare. The three approach sections on either side were duplicates and the center section was horizontal. The two end sections which took the first blow of approaching traffic measured 5 feet

(Continued on page 31)



Belt Conveyors in the Portland Production Plant Loading Aggregate for Bonneville

*Thousands
OF MILES*



*INSTEAD OF
Hundreds*

U. S. No. 37 near Frankfort, Ky., showing portion of twelve-mile section which has a serviceable, skidproof, low-cost Texaco surface

Traffic counts prove that hundreds of miles of expensive, heavy-duty paving have been constructed, where lighter types would have been entirely adequate.

Thousands of miles of low-cost, traffic-resisting asphalt surfacing could have been built for the price of the small mileage of hard-surfacing obtained.

Before designing a new road, study carefully existing and anticipated traffic. It is very likely that one or more inches of low cost road-mix or pre-mix TEXACO Asphalt surfacing will furnish an ideal solution. This sound policy brings good roads to far more taxpayers and reduces automobile operating cost on a substantially greater mileage of highways.

TEXACO

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CLEVELAND
KANSAS CITY
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Point Number 1— Highway Construction

At last Franklin Delano Roosevelt has spoken, the only man who can speak with any authority in the semi-dictatorship we are enjoying in this free country, and now we know in some measure how the money from the \$4,800,000,000 work relief fund is to be expended. We congratulate the President that he has chosen as Number One of his Eight-Point Program, "Highway construction, grade crossing elimination." These are the two fields in which there are established agencies ready with the plans for the rapid placing of these funds in active service and in such a manner that the communities in which the projects are located will receive benefits both immediate, in the employment of the citizens in need of work, and in the future in the value of improved highways and grade crossing eliminations to make safer the traveled way of the motorist and the passenger on the railroad train.

The well-organized state highway departments have been ready with plans for their highway systems for many years. These plans have been completed for several years and the furnishing of further funds from the Federal treasury for their translation into reality will benefit every state in the country through the money which will be expended for the materials of construction, wages which go into all fields of trade and the creation of capital assets in the structures themselves.

Of interest also to other branches of the construction industry are other "points" of the President's program. The construction of the electric transmission lines necessary to the carrying out of the rural electrification program, the construction of low-cost housing in the rural and urban areas, soil erosion and reforestation, all will require the services of the contractors of the nation in their successful and economical completion. We hope that the President will realize the folly of using these funds entirely for the creation of a political machine, but will see to their fair and honest distribution through the normal channels of industry to recreate private endeavor which has been in the invalid state for so many years.

Recovery Acts Adopted by Seven More States

Now that it has become increasingly evident that the National Industrial Recovery Act will be extended, with strengthening additions, for a period of at least two years, the importance of urging the enactment of State Industrial Recovery Acts comes to the forefront, according to a release from the Construction Code Authority.

Seven states have adopted uniform State Industrial Recovery Acts and similar measures have been introduced into the legislatures of twenty-three others, according to information received from the NRA State Relations Officer. These states are Idaho, New

The President did not include any statement that funds would be used for airport work, but Secretary of Commerce Roper has made a plea for some slice of the four billion odd million dollars for that purpose. He has not stated at this writing just how the money will be expended but if it will be to improve in a permanent manner the airports of the smaller communities and make them of greater service as emergency landing fields for large planes and if the work will be done by well-administered forces of local unemployed labor using unemployed engineers to direct the work, there is hope for great improvements to this new transportation industry. We feel that large airport grading projects should be awarded by contract to continue the policy we have urged before that the organizations of contractors throughout the nation be continued as units of labor for large construction projects.

Keeping Wild Steers off the Pavement

We have heard contractors in various parts of the country tell about what they would like to do to some of the "wild Indians" who would break through any kind of a barrier and drive onto concrete less than 12 hours old. On this trip through the southwest, we even saw a grocery truck make a wild dash onto some concrete about an hour old in order to save a run around a city block.

It remained for Red Williams, Superintendent for Russ Mitchell on a job in Brazoria County, Texas, to face the real problem of keeping a herd of over 1,000 wild steers off his new slab. He was warned that this herd, which included some Brahma steers, would come by his job on a certain day. Knowing full well that all the laborers, Rangers, and troops that could be mustered would clear out when those wild beasts turned on them, Williams set up a four-wire barbed wire fence along the new slab for a distance of about 1,200 feet where there was the best chance of trouble. The fence posts were old railroad ties set solidly into the grade at the edge of the slab. And the scheme worked!

Mexico, Wyoming, Oregon, Washington, Indiana and West Virginia.

As applying particularly to the Construction Code, information has been received from the Indiana Code Compliance Bureau, a coordinated Construction Code administrative agency which operates a joint bid depository in Indianapolis, that previous to the enactment of the Indiana Industrial Recovery Act, which was signed March 9, it was difficult to interest the smaller contractors in filing duplicate bids but that since its enactment, compliance has improved immeasurably.

The states which have enacted State Recovery Acts are, in addition to those noted above: California, Colorado, Illinois, New York, Wisconsin, Ohio, South Carolina, Utah, and Virginia.

Engineer Presents Both Sides of Question

To the Editor
Contractors and Engineers Monthly

We are inclined to agree that there is ground for some complaint regarding certain practices in charging contractors for plans and for bidding documents. At the same time, there is another side to the question.

In some cases, bidding is by invitation and not many sets of plans are needed. However, where bidding is open, as in public work, it may well be that the cost of duplicating contract documents is quite an item in the fee of any engineer. The difficulty arises not so much from the general contractor as from the multiplicity of hopeful subcontractors and material and equipment dealers, all of whom have a proper interest in the undertaking.

Reasonable competition is advantageous to the client and he should bear the cost, but unless this cost can be determined in advance, and is included in the fee, it is difficult—particularly on public work—for the engineer to make any recovery.

In our own practice we have finally adopted the procedure of requiring a deposit for all plans and specifications, the amount of the deposit being roughly proportional to the cost of reproduction. In the event a legal proposal is submitted, the full amount of the deposit is refunded when the plans are returned. If no proposal is submitted, half of the deposit is refunded when the plans are returned. In addition to giving out plans in this manner, we also place them on file in our office and with contractors' associations under conditions that permit of examination and study.

This method is not entirely satisfactory, but it does not penalize a bona fide bidder and it divides the burden with equipment dealers and others who wish to take off quantities in their own offices.

Your correspondent describes a situation that is undoubtedly vexing to the contractor who bids widely. Insofar as the practice runs counter to the advantage of the client, it should be possible to institute remedies, largely by education of the client. It would, we believe, help if contractor and engineer associations could themselves agree as to what constitutes fair practice.

George B. Gascoigne
CONSULTING ENGINEER

Cleveland, Ohio
March 26, 1935

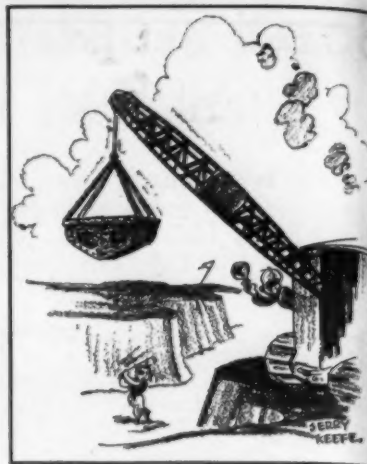
Charge for Plans Justified, Says Chicago Engineer

To the Editor
Contractors and Engineers Monthly

In regard to the matter of a charge frequently made for plans by consulting engineers, I am of the opinion that those persons making the charge of "racketeering" have spoken without having knowledge of the matter.

When work is advertised, these days, there is such a demand for plans as to constitute a real burden on an office unless some charge is made. Not only do general contractors want plans, but every possible sub, many civil engineering departments of colleges, all material supply houses, and so on. Frequently as many as twenty or twenty-five sets of plans are requested, and it is rarely that even the postage is forwarded. When the plans are returned, they are frequently mutilated, dirty and unusable, and if the deposit is denied there is always trouble. Since these costs usually are borne by the consultant, and the specifications are usually typed, it may be seen that the problem is not as simple as it might appear.

The practice in this office is as follows: our arrangement with our client is to furnish a definite number of sets



Courtesy Midwest Golfer

"Can I give you a lift, lady?"

Moving and Re-Erecting The Vatican Obelisk

Early in the first century A.D., Emperor Caius Caligula brought from Heliopolis to Rome the shaft now known as the Vatican Obelisk, which today stands in the center of the plaza in front of St. Peter's. How this 325-ton shaft of granite, 88 feet long, was conveyed to Rome and set up in the Circus of Nero does not appear to be recorded. In 1585 it was found in a dirty and unfrequented part of the city, tipped 17 inches from the vertical and with its pedestal buried in rubbish and mud.

It fell to a 42-year old engineer, Dominicus Fontana, to be awarded a prize for the best plans for moving it by lowering the shaft to a horizontal position and moving it the required 825 feet on rollers and re-erecting it with pulleys, ropes and capstans. He calculated the weight of the shaft, sheathing and metal attachments to be 350 tons and decided upon forty capstans and tackles operated by 800 men and 75 horses to lift the obelisk. This was supplemented by five 40-foot levers and wood and iron wedges driven between the bottom of the shaft and its base, for the initial lifting. The work started April 28, 1586. The gigantic task was finally completed about the middle of September at a complete cost of \$44,000.

The development of our highways to date is the outstanding advance in America's social and economic progress in the twentieth century. These roads have remade the habits of our people and revolutionized our business. They have integrated this country as nothing else could have done. They brought communities and people out of isolation. At the moment, no less than 45,000 communities in the United States are without any facilities of transport other than the people's highways.

—Roy W. Britton, Director, National Highway Users Conference.

Few, if any of the accidents reported during 1934 to the Construction Section of the National Safety Council, did not present means of remedying conditions, if subjected to analysis. Let's make 1935 a record year for safety in construction!

of plans and specifications (usually four) to him at his office. Plans are also on file in our office and space is provided, so that any one wishing to do so may examine and work over the same. The successful bidder of course gets as many plans as he needs. All others are charged the cost of the same. We consider this fair. We might note in passing that under the code the cost of reproductions have been nearly doubled in the past two years.

Paul E. Green
MARR, GREEN & OPPEN
ENGINEERS

Chicago, Ill.
April 3, 1935

Sand-Asphalt Paving on 6.97-Mile Project

(Photos on page 44)

AN interesting example of the far-reaching effect of the rulings of the U. S. Bureau of Public Roads came to light on a sand-asphalt paving project near Mobile, Ala. Formerly the state specifications ruled out any but pugmill mixers for the sand asphalt. Special provisions for this project permitted the use of a rotary mixer as the work was a NRH project and the Bureau of Public Roads had permitted this type of mixer on other work in other states. When the bids were opened, it was found that a contractor who uses such a mixer of his own manufacture was low and he was awarded the contract.

The job was on Alabama Route 42 northwest of Mobile and is a link in several paving projects of recent date, including concrete paving. The contract for the sand-asphalt paving was for 6.97 miles of 20-foot roadway with 5-foot shoulders on either side. The paving was entirely over an old right-of-way except where curves were eased.

Grading

The contractor, Sam E. Finley of Atlanta, Ga., started grading January 10, 1934, but did not set up his asphalt plant until the latter part of February and actual paving did not start until April 19, 1934. Grading was handled with an Austin elevating grader pulled by a Caterpillar Sixty, loading about 30,000 cubic yards of earth to four hired trucks hauling within the free haul distance of 1,000 feet.

The fine grade was struck with a Caterpillar Thirty-Five diesel pulling a Caterpillar 12-foot blade grader. The fine grade and form crew consisted of two men digging the trench, which was not an arduous task as the grade was entirely through sand, four men driving stakes, two men setting the 3 x 6-inch forms, two men nailing the forms to the stakes and lining them up, two men driving stakes to grade and preliminary lining of forms, two graders who hand-finished the trench, two men backfilling the form trench and tamping the material, two men back lining up the forms, a water boy and a foreman.

Where the grade was dry and hence difficult to work, as it was all sand, a sprinkling truck consisting of a 500-gallon tank mounted on a Chevrolet truck was used just ahead of the strike-off board used by the grade crew. This strike-off consisted of a 4 x 12-inch board cut to the crown of the road with an angle iron on the bottom and with bolts every 6 inches to adjust the iron to the crown or to take out the crown entirely on superelevated curves. This was pulled by the 8-ton Buffalo-Springfield tandem roller which was kept ahead to roll the grade. The grade crew on this work consisted of the foreman, and six men. A similar crew worked at night to get the grade in shape ahead. At that time the work was lighted by a pair of Oxweld-Acetylene carbide lights, and the strike-off was pulled by a tractor.

Form-Setting

While the specifications required that the 3 x 6-inch forms be dressed only on the top and one side the contractor used material dressed on all four sides, and in lengths of 10 to 15 feet. The forms were staked every 2 feet with special stakes cut from 2 x 4's, 24 inches long and tapered for 21 inches. The forms were nailed to the stakes with one nail driven inward and one outward. There was a stake on either side of each joint also nailed.

Plant Operation

The mixing plant, including the

Portable Hot-Mix Plant of Contractor's Design Handled 300 Tons Daily on Alabama Contract

drier, was delivered to the site by three specially-built motor trucks which haul it from one job to another and was set up in a sand pit near the center of the contract. Unfortunately there was an excess of fines in the pit so that coarser sand had to be hauled in from another pit about 1/4 mile away, by two 1 1/2-yard Ford trucks. The material was clammed out to a stockpile by a Link-Belt crane with a 50-foot boom and a 3/4-yard Williams bucket. By selecting



C. & E. M. Photo

Pulling the Strike-Off Just Ahead of Spreading the Sand Asphalt

from one pile or the other the crane operator supplied the proper mixture of material to the feeding gate where three men pushed the sand toward the bucket elevator to the rotary drier. There was another man at the top of

the bucket elevator to watch the delivery to the drier.

The rotary drier was 35 feet long and 5 feet in diameter and was heated by two fuel oil torches at the discharge

(Continued on page 26)

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Big Dragline Ferried on Scows

The Columbia Construction Co., contractor for the main spillway dam of the Bonneville project, had been using a Bucyrus-Monaghan 75-B walking dragline on the Washington side of the Columbia River on channel diversion work. When this was completed in February of this year, it was desired to move the dragline across the channel to the south cofferdam on Bradford Island. About a quarter of a mile of very swift current intervened.

The 443-ton equipment was brought over safely on a ferry consisting of two 38-foot x 120-foot barges fastened side by side.

Shore docks were built on both sides of the river, with adjacent bulkhead docks alongside to secure the necessary depth of water at the shore line. In the meantime, eight 36-inch steel I-beams had been mounted on the barges crosswise of the two and parallel with each other. Two beams on each side were placed adjoining and the others spaced between, supported in upright position by timbering.

The ends of the I-beams were made to project about 6 feet over the side of one of the barges. When the barges were manipulated into the bulkhead on the Washington side to load, the ends of the I-beams projected out over the shore dock. Water was then pumped into the barges and they were sunk until the ends of the beams rested on the shore dock. The dragline was then walked onto the barges over the I-beams, which were also its support on the barges during the trip. Water was then pumped out until the I-beams floated clear of the dock.

Lines from the cofferdam across the river held the barges as they were swung out into the stream, controlled by two tugs. Thus the unique ferry was floated downstream and around until it came into slack water behind the cofferdam. Then it was towed up into the bulkhead at the unloading dock, swung into position so that the projecting beams were over the shore dock, the barges again sunk until the beams rested on the dock, and the dragline was walked off.

It took about 10 days to do the whole job, including building of the docks and bulkheads. But the actual crossing was safely accomplished in about an hour and a half.

Asphalt Industry Outlook Better Than Ever, Says Boye

The opportunities for expansion of the asphalt industry are greater now than ever before, said B. L. Boye, recently reelected President of The Asphalt Institute, citing use of asphalt in protecting Mississippi River banks, the greater use of asphalt in PWA highways, and the increasing speed of cars,



Barges Bearing the Heavy Dragline Being Swung Into Position. A Diesel Seventy-Five in the Foreground Assists in the Operations.

rendering flexible roads a necessity.

Pointing out that highways of the future must be non-rigid and resilient in order to keep pace with greater auto-

mobile speeds, Mr. Boye explained that Sir Malcolm Campbell's speed tests are made at Daytona Beach because the packed sand is resilient.

"Today's best highways," said Mr. Boye, "although smooth at today's speeds, would tear a car to pieces at the potentially greater speeds of the future. Roads of tomorrow will reduce vibration 40 per cent via two-course construction, a foundation and a wearing surface."

Patterson Foundry Appoints New Research Man

Patterson Foundry & Machine Co., of East Liverpool, Ohio, has announced the appointment of Oliver F. Redd to the Research Department. Mr. Redd, who has specialized in engineering physics and has for several years been engaged in development engineering work in the Western Electric Department of the Bell Telephone Laboratories in Chicago, will do research work in connection with mixing, agitating, grinding and other problems and also in the development of new or modified equipment for the process industries.

WHY THOUSANDS WHO HAVE TRIED ALL THREE LOWEST-PRICED TRUCKS



"Upward of 50,000 miles efficient operation before valve grinding, unusual oil economy, no rear end or clutch troubles whatever, tires last unusually long in our experience. Our drivers, too, like to drive our Dodges. As one man said, 'When I have to stop it's no longer a gamble.'"

ROY S. STUBBS, Pres.
The Only Way Transfer & Warehouse Co., Kansas City, Mo.



"For the past 20 years we have operated a fleet of trucks and have checked operating costs of different makes. We have now decided to standardize on Dodge because we find it is the best built of the three lowest-priced trucks. Our drivers also show a marked preference for Dodge."

FRANK P. RUPRECHT, Secy. & Treas.
Ruprecht Building Materials Co., St. Louis, Mo.



"I have always known that Dodge is a dependable truck, but the economy of operation is what amazed me most. I have owned trucks for 10 years and a careful check on our records shows that our Dodge truck has saved us at least \$100.00 in operating expenses the past year. In other words, it hasn't cost us a penny for repairs for the entire year we have had this truck."

SAMUEL GERSHMAN
Western Wet Wash Laundry, Chicago, Ill.

Are Switching to DODGE!



"I decided to buy my new truck on the basis of a 'show-down' between the three lowest-priced trucks. Dodge won out because to my mind there was no question about the extra high-priced truck features Dodge gives you, like hydraulic brakes, full-floating rear axle, valve seat inserts and other things that every truck owner knows will cut operating costs and upkeep expense."

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Acme Cartage Co., Seattle, Wash.



"After using each of the other two lowest-priced trucks I recently bought a Dodge. My expenses for gas, oil and upkeep at the end of 8,000 miles is the lowest I have ever heard of. Dodge gives me everything I have always wanted in a truck and now at today's prices if you can buy any truck you can afford a Dodge."

ARSENÉ TINGAUD, JR.
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"IT JUST doesn't belong in the lowest-priced field, but it is!" "Dodge wins over the other two lowest-priced trucks by an amazing margin" . . . that's what thousands of smart truck buyers everywhere who have tried "all three" are saying.

Dodge leads in value because Dodge has built extra value into Dodge trucks from one end to the other. Dodge pioneered full-floating rear axles in lowest-priced trucks, to save you money on upkeep. Dodge pioneered valve seat inserts, to save you gas and valve grinding costs.

Only Dodge Has Hydraulic Brakes

Among the three lowest-priced trucks, Dodge alone gives you safe, sure, dependable, money-saving hydraulic

brakes. Dodge perfected hydraulic brakes stay equalized . . . save tires, brake linings and adjustment expense.

Dodge alone of the three lowest-priced trucks gives you an oil filter. Only Dodge gives you 4 piston rings . . . the others 3. Dodge gives you 4 main bearings . . . the others 3.

Of the three lowest-priced trucks, Dodge is the only one built in an exclusive truck plant by trained truck craftsmen.

No wonder thousands are switching to Dodge! Check the three lowest-priced trucks for money-saving features . . . then check the delivered prices. You can see in three minutes why Dodge is the best buy. See your Dodge dealer today.

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1 1/2-TON CHASSIS AND CAB—
6-cylinder—136" wheelbase—Full-floating rear axle, hydraulic brakes, valve seat inserts, roller-bearing universals—18 recognized, money-saving features. (Body, hoist and special equipment extra).

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COMMERCIAL EXPRESS—6-cylinder—111 1/4" wheelbase. Amazing low price—with 18 high-priced features to save you money every mile it is driven. Fast, dependable, sturdy. Compare it! See your Dodge dealer and ask him for a "show-down" against the other lowest-priced trucks.



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Development of the Motorized Grader

By A. O. TECKEMEYER

of The Austin-Western Road Machinery Co.

Right after the Great War, when road-building was resumed, contractors faced a shortage of labor. Partly because of this condition a machine to eliminate a good deal of hand work in grading between forms was developed. This was a Grader with a self-contained power unit ahead of the blade unit—a combination tractor grader. Since a two unit grader and tractor was too cumbersome to use between the forms and could not be turned readily, nor backed up, this made quite logical the placement of the blade ahead of the power unit, all carried on one frame. Originally steel tired wheels were used. The operator sat directly above the blade so that he had a direct view of his work and could control his tractor from the seat. Thus one man operated the complete unit and it was generally called a "One-Man Grader." The machine was so practical that the field was enlarged to include the maintenance of roads. One man with a power grader could maintain the same number of miles of roads that four separate horse-drawn patrol units could cover at a saving of approximately 50%.

Refinements of Design

As the use of the one-man power grader developed and the low cost operation of this unit was discovered, improvements were made—First the control of the machine was changed from center to rear for it was found that the operation of the machine and the visibility was such that a man could operate the unit more efficiently from a control back of the motor. The power plant was originally a 20 h.p. engine, but as improvements were made in design additional power was added: first to 30 h.p., then to 42 h.p. until at present such machines are designed with 53 h.p. motors. From the steel tired wheels originally used, the next step was to solid rubber. At about the same time crawler tracks were used for the driving power. The use of crawlers however involved a number of problems, and the cost of maintenance over the number of miles the patrol grader operated proved expensive. As a result of these handicaps there was developed a set of four driving wheels on the rear, affording additional traction and stability for the machine. As pneumatic tires were developed they supplanted solid rubber tires and among other advantages afforded a means of using four tires on the Single Drive and eight on the dual or four-wheel drive machine.

During this gradual evolution of the motor grader various new uses were discovered. The speed of operation and ease of control made it eminently suitable for scarifying.

Another attachment that was developed with merit was the front V-type Snow Plow. This increased the use of the machine considerably because the ordinary type of road grading equipment could be used only during the construction or maintenance season, whereas the Motor Grader with the snow plow and the blade could be used 12 months of the year.

Hydraulic Controls

Having power available caused engineers to wonder why some of this couldn't be made to operate the various controls, thus increasing the use and efficiency of the Motor Grader. Such an improvement would enable the operator to do more work with less effort, increase the work done and improve the character of the work. The use

Advertisement

of hydraulic and mechanical power control was a jump of just a few years ago. The power controls were made to operate the various blade movements such as raising and lowering the blade and scarifier, side shifting and reversing of the blade. The only manual control remaining was the steering of the machine. But the application by Austin-Western of hydraulic power controls facilitated the easy adoption of the hydraulic steer so that now Motor Graders are available with every control accomplished through small levers which can be operated with the pressure of one finger.

Along with the improved operation of the controls and new design of the drive arrangement, additional stability was built into the Motor Grader. In place of working only on top of the road, the machine could be used for ditch work and rough grading. The development of the wide front axle and

Advertisement

leaning wheel provided stability for the front end to enable the machine to cut a ditch line.

Another refinement of Motor Grader design was the addition of wider range speed adjustments. Originally the machines had three-speed transmissions of 1 to 4 miles per hour. The present Motor Grader uses six speeds forward and has a range of speeds from $1\frac{1}{2}$ to 13 miles per hour and two speeds reverse, enabling each job to be done at the most economical speed.

Wide Field of Usefulness

Motor Graders are used now by all who have ever used any type of road machinery. The Lane Company of Connecticut, McDonald Construction Company of New York, the Atkinson Paving Company of Portland, Oregon, the Inland Construction Company of Omaha, Sam E. Findley of Atlanta, Georgia, and Frederickson and Watson

Advertisement

of California, are all contractors using one or more modern power controlled four-wheel Drive Motor Graders on their work. Practically every State government operates a Motor Grader, and some employ as many as five hundred. Pennsylvania has used Motor Graders in the development of its program which required the taking over of many miles of town roads. Cities and villages use them for maintaining and building outlying streets as well as for snow removal work, and with the addition of a bulldozer on the front of the machine, have given them the job of keeping city dumps level. Counties use the machine for maintaining, oil mix, cleaning of ditches, and snow removal work.

The present powerful hydraulically controlled Motor Grader with eight driving tires signifies progress in the highest degree because it means more work accomplished at less cost.

The New **PLUS** in Road Rolling— **RESERVE PRESSURE**

QUALITY POINT . . .

Within $\frac{1}{8}$ -Inch Surface Variation Under 10-Foot Straight Edge.

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Rolling Time 30% to 50% Less—No Cross Rolling.

● The center roll of a Roll-A-Plane is a sentinel placed on guard in the plane of the front and rear rolls, to detect and reduce every irregularity. The diagrams at the right show how it becomes self-actuating after once being lowered into position. The greater the irregularity to be reduced, the greater the force brought to bear at the third pressure point—up to 85% of the machine's weight if necessary. The center roll exerts a negligible force when no high spot appears but concentrates a practically irresistible force in a kneading, compacting, leveling action when an irregularity is met. Its alignment in relation to the other rolls establishes a true plane which is transferred to the surface being rolled.

Engineers are discovering new values in the principle as more and more Roll-A-Planes are put into service. Contractors and highway officials are discovering a new conception of levelness and a new low cost for quality roads. The industry is accepting as its standard the Roll-A-Plane, or Austin-Western Rollers on which the Roll-A-Plane feature can be added later. A new booklet now on the press describes the Roll-A-Plane process. Send the coupon.

The Austin-Western Road Machinery Co.

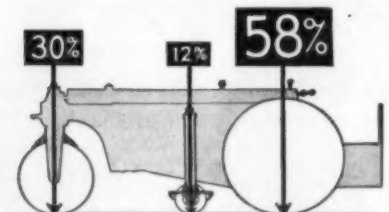
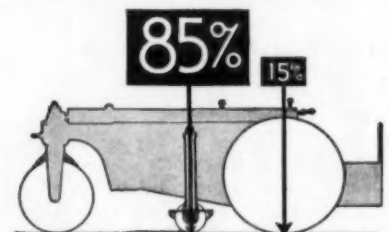
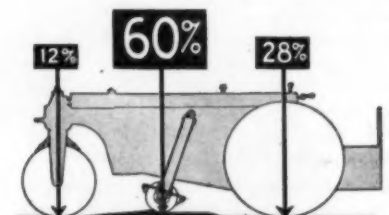
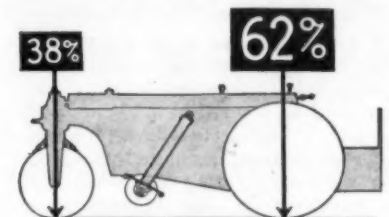
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Widening Texas Road with Truck Mixers

A CONTRACTOR who believes that truck mixers can solve many of his small but numerous concreting problems recently completed an NRM concrete widening project in southeastern Texas. State Route 8 leads from Beaumont to eastern Texas and was originally built 18 feet wide. Last summer a contract was let for widening this 3 feet on each side for a distance of 1.4 miles within the city limits of Beaumont. While nothing can beat the 27E paver for pouring 20-foot pavement, the constant moving and pouring of narrow strips on widening projects is a job just made for the truck mixer. Using a pair of Rex truck mixers with aluminum drums it was possible to mount them on Chevrolet trucks and thus secure economical units able to travel rapidly. With an average haul of 5.2 miles the mixer trucks made their trips in 20 minutes loaded. Thus when a stretch of grade was ready for pouring, the Superintendent called for the trucks to start loading and they showed up on the job 20 minutes later ready to pour.

Work started on July 9 and pouring began on July 11, 1934. One side, a strip 36 inches wide, 9 inches thick at the old concrete, 7 inches thick at the forms and 1.4 miles long, was poured in seven working days with two of the Rex truck mixers hauling the 5.2 miles from the batching plant and carrying a 9-sack batch of 1.8 cubic yards absolute volume.

Crossings Opened in 72 Hours

It was found that a 500-pound modulus of rupture on the standard test beam, normally requiring 10 days' curing, could be secured in 72 hours with the use of high-early-strength cement. The specifications permitted the Resident Engineer to open any section of the pavement in case of emergency whenever the beams showed the 500-pound modulus. Thus side roads serving small communities, entrances to filling stations and roadside stands could be opened promptly, saving much inconvenience and loss of business and minimizing the amount of bridging needed to carry the side-road traffic.

Preparation of Grade for Pouring

Because the old shoulder of the original road was so hard packed by traffic, it was impossible to break it up with hand picks. A McCormick-Deering tractor with a Lakewood scarifier was put in to loosen the 3-foot strip to a depth of 9 inches against the old concrete and 7 inches at the form line. The old slab was of 9-6-9-inch section. The loosened sand-clay shoulder material was mucked out with a 2-up mule team and fresno, the owner of which worked his 30 hours and then put another laborer on for the second 30-hour period that the team was permitted to work.

A fine grade crew of about fourteen negro laborers then went in with mattocks and shovels and trimmed the grade, four of them cutting the form trench slightly deeper than the grade for the 9-inch Blaw-Knox steel forms which were used for the outer 7-inch thickness of slab. The widening strip sloped $\frac{3}{4}$ -inch from the old slab in its 3-foot width. At first the form setters were permitted to place the forms from the old slab but the final form line was found to be wavy because of the variations of the older pavement. The line then was set about every 30 feet and the intermediate pins and grade set by eye, giving a much more even result.

Two men set forms to line and grade and then three men behind lined up the forms and the fine grade crew filled in against them where the trench had been cut low to accommodate the deeper

Broussard-Warfield Handled NRM Project in Beaumont, Texas with 5-Mile Haul

forms. This section was hand tamped to give a firm foundation. The three men who lined up the forms were finishers who were naturally most interested in having the forms accurate. This division of labor would not have been possible, however, if pouring had been done every day which would have required a separate crew for the two operations. Two reinforcing bars $\frac{1}{2}$ -inch in diameter, not dipped or painted, and measuring 40 feet in length were placed in the widening strip to give continuous

reinforcement. They were set 6 inches and 18 inches from the form line and 2 inches above the grade, using sheet metal pins through which they were threaded.

Batching and Pouring

The contractor's batching plant was located at his permanent yard about 5.2 miles average haul from this contract. A P & H crane with a 50-foot boom unloaded the gravel and sand from the gondola cars with a Blaw-Knox clamshell and filled the bin of the Johnson batching plant. Because of the few hours a day that batching was actually in progress it was found more economical to employ one man to handle both the crane and batching by weight.

The truck mixers drove up to the batching plant and backed under to receive their individual batches of 2,237 pounds of sand, and 3,981 pounds of gravel. They then drove to the cement house where two laborers emptied the 9 bags of cement into the drum and filled the water tank with 5.8 gallons

of water per sack of cement, which produced a workability factor of 80. The batches were mixed the entire trip to the job.

Upon arriving, the truck, which delivered the concrete from the rear, ran alongside the strip and the concreting crew took charge. The driver drove ahead slowly as directed after the radial

(Continued on page 29)

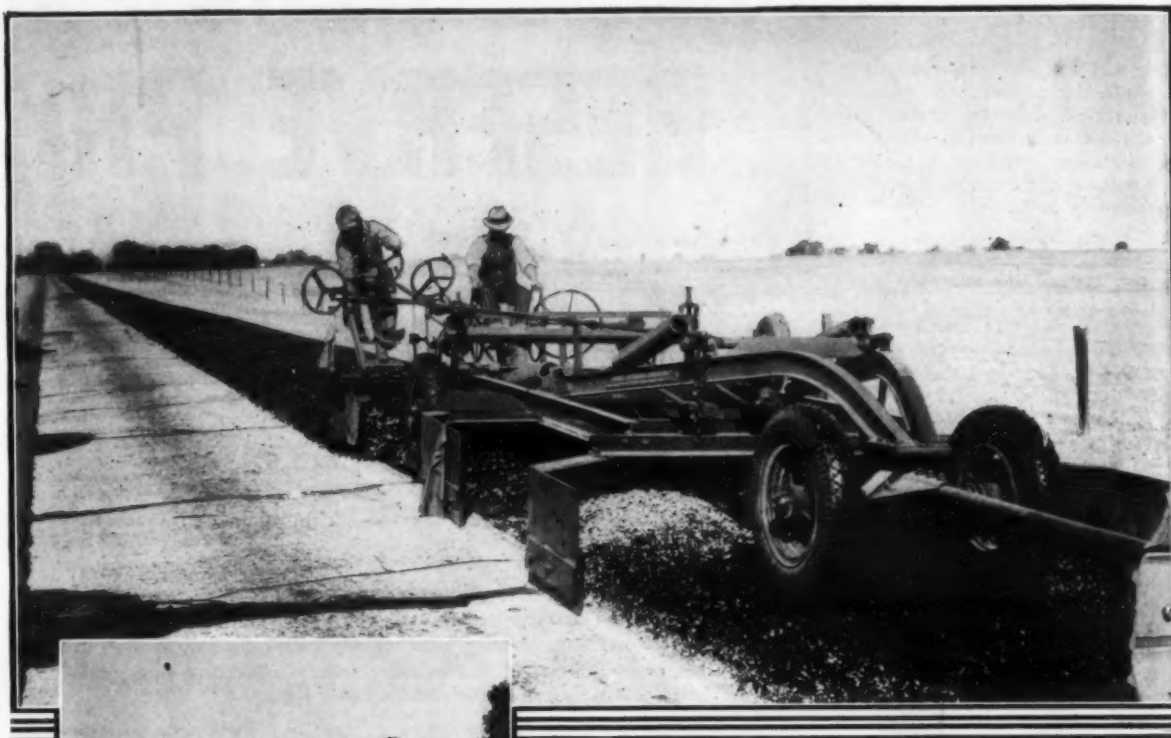


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LANSING Contractors' Barrow
... with Pneumatic Rubber Tire
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Upper Illustration: Paver laying a bituminous course on an old concrete pavement. This job was laid in two 11 ft. strips joined at the center. One passage of the machine mixed and spread this crushed stone and asphalt to the entire satisfaction of the Engineers.

Lower Illustration: Shows the more common practice of applying a bituminous course to an old gravel or stone road, mixing and spreading the entire width of the course by making round trips. Note the uniform finish and clean edges in both illustrations.



The Adams Line includes Leaning Wheel Graders, Motor Graders, Elevating Graders, Dump Trailers, Road Maintainers, Rotary Scrapers, Road Rippers, Scarifiers, Plows and Horse-Drawn Earth Moving Tools. Write for catalogs and folders describing these items.

A Quicker Mix and a Better Finish

On your bituminous "road mix" jobs, why not get better results and at the same time save money by using a machine especially designed for this work?

Adams Retread Paver mixes bituminous coated aggregate three times in one trip. Compare this with the many trips necessary with single blade machines. Mixing costs are reduced and a better mix is obtained because it is accomplished while the bituminous material is in its most liquid state.

The same machine spreads the mixed material to exact width and cross-section desired, smooth as a floor and ready for rolling. Edges are straight and clean cut—hand work is practically eliminated. A better finish is obtained at less cost.

Before starting another job, talk this over with your local Adams representative or distributor or write for complete details.

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GIVES YOU MORE TRACTION GREATER SAFETY—LONGER WEAR—AT HIGHER SPEEDS

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Super traction tire
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The tire that
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Volume produc-
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FIRESTONE patented construction features enable us to give you a tire with higher shoulders—wider and deeper non-skid tread.

The cords in the body are Gum-Dipped, giving greater strength and longer flexing life.

The two extra layers of Gum-Dipped cords under the tread give a firmer union between tread and body which holds this heavy non-skid tread securely to the tire body.

Equip today with these safe and economical tires! You will get uninterrupted service, maintain faster schedules and get safety protection beyond anything you have heretofore experienced.

Call on the Firestone Service Store or Service Dealer now and start reducing your operating costs today.

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Proportionately Low**Firestone**

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Greatest tire ever
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BELTSFIRESTONE
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Firestone

Aggregate Handling and Concreting at Bonneville Dam

(Continued from page 2)

Another 30-inch conveyor, on 460-foot centers, runs through the tunnel. Nineteen radial gates admit the materials from the piles to this conveyor, which in turn feeds to a 400-foot 30-inch inclined conveyor to the batching plant.

The conveying equipment is operated throughout by Allis-Chalmers Falk-gear motors with the exception of the one on the bucket elevator, which is provided with chain drive. Motors are 123 hp for the lift, 15 hp for the cross conveyor, 25 hp for the conveyor over storage, 20 hp for the tunnel and 50 hp for the incline. Dodge D.T.I. troughing rolls are used with Dodge-Timken roller bearings and Republic Rubber Co. belt.

Cement Handling and Storage

Located 80 yards from the batching plant is a 15-car capacity steel tank on a steel tower for cement storage. The cars are unloaded by a manually-operated dragline scraper into a hopper. A Fuller-Kinyon pumping unit, located below ground level under the hopper, delivers either direct to the batching plant through an underground pipe, or into the storage tank above. A 60 hp G-E motor operates this unit.

Batching and Mixing Plant

This plant, supported on 14-inch H-beams and rising about 100 feet, has a capacity of about 2,000 cubic yards of concrete a day. The Cramer Machinery Co. of Portland furnished this plant which was designed and fabricated for this job by the C. S. Johnson Co.

At the top of the plant is a centrally located cement compartment of 750 barrels capacity, together with radially disposed aggregate bins having a total capacity of 1,200 tons. Two grades of stone and three of sand enter these compartments through a distributing chute. Water comes from a tank adjoining the mixing plant. Indicators showing at the silo and mixing operator's station indicate when the cement compartment is full or empty. Four classes of concrete are batched—A, B, and C concrete and grout.

On the floor below are the weigh batchers and the control station for the entire batching and mixing plant. There are seven interlocking, air-operated weigh batchers. Weighing is automatic, with an accuracy within one per cent.

A graphic recorder shows the weight of each material in every batch, together with the consistency of the concrete. This record is on one sheet of paper, being coordinated and accurate to one per cent. The pendulum type scales are of Kron make and the two batch meters Koehring.

A collecting cone receives the discharge from the batchers and delivers it to an air-operated swivel chute lead-

ing to the two mixers below. Water passes through a separate part of the chute to the mixers.

The single operator is in full view of the batchers, recorder and consistency indicators. He sees the mixers through floor windows, and through a side window he sees the concrete train and loading platform of the hi-line. He controls and dumps the mixers, operates the swivel chute and by lever selects the class of concrete to be mixed. As stated, the system is interlocked. It is impossible to short mix, charge an undumped mixer or one not in a position to be charged. Lights indicate when each operation is finished and when the next may begin.

Moving the Concrete

There are two 3-yard mixers. They are tilted to discharge to a two-hopper dump car of 6 yards capacity. The mixers and car were manufactured by the Norris K. Davis Co. of San Francisco. The locomotive is a Plymouth Type 6 Model DLC with St. Paul hy-

draulic hoist. The shuttle track on which it operates is 250 feet long to the loading platform. This train operates in synchronism with the 1½-minute mixing period of the plant.

The car dumps direct to a 6-yard bucket traveling on the cableway direct to the forms. The cableway leads from an A-frame head tower located on the Island to two movable tail towers operating on a radial track on the hillside above the locks. The tower runway is 600 feet long and the span of the Roebling and Leschen cables is 1,390 feet. This cableway will not quite serve the upper and lower ends of the locks and part of the power house wall. Concrete will be laid in these places by a Rex Pumpcrete unit to be installed on the loading dock. After placing, the concrete is internally vibrated by Viber machines at 4,000 strokes per minute.

No special cement has been used on this work. The concrete is made with the standard cement of the Oregon Portland Cement Co. from its Lime and

Oswego plants, and the Beaver Portland Cement Co. from the Gold Hill plant.

Personnel

The general contractor on the power house substructure and navigation locks is the General Construction Co. and J. F. Shea Co., Inc., of Portland, Ore. The General Superintendent is Ben Cook. The Resident Engineer is Captain J. S. Grolinski, Corps of Engineers, U.S.A.

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A Cletrac 40 Diesel and six yard scraper, owned by John Keahey of Sheridan, Wyoming, are shown at work on a cut and fill highway grading job. Temperatures were continuously below freezing and the hard, unscarified clay was frozen 6" to 8" deep. The 40 Diesel averaged 65 yards per hour on a 350 foot haul. Fuel consumption was 2.6 gallons per hour at a fuel cost of less than ½ cent per yard. Cletrac owners everywhere are showing results like these.

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New Water Tunnel Pushed in Rockies

Typical Drilling Rounds Varied to Meet Conditions on 9-Foot, 5½-Inch Tunnel for West Slope Waters

COLORADO cantaloupes instead of thirsty Southern Californians will be consuming the waters from Lincoln Gulch and its tributaries on the West Slope of the Rocky Mountains near Leadville, Colo., when a 3.7-mile tunnel through Independence Pass, which was holed through in February, is completed. Waters which normally would flow down the Colorado River to Hoover Dam will be carried beneath the Continental Divide to Twin Lakes Reservoir and sent down the Arkansas River to water fields of Rocky Ford cantaloupes and sugar beets. It is expected that the first water will be turned through this month.

The Twin Lakes Reservoir Canal Co., an organization of Colorado farmers, awarded the contract for driving the 20,334-foot tunnel to Platt Rogers, Inc., of Pueblo, Colo.

Many Difficulties Encountered

At the west portal, the tunnel is at an altitude of 10,503 feet, which means plenty of snow, long winters and intense cold. The east portal at an elevation of 10,453 feet is 3.7 miles away but by road is 20 miles away in summer. In winter the distance is 194 miles because it is impossible to maintain an open road over Independence Pass after snow falls.

Electric power is secured from Aspen, Colo. 25 miles away, over a 13,000-volt line. The west portal is 6 miles from the main highway which necessitated the building of a new road.

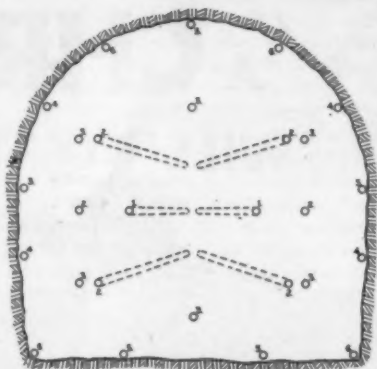
Tunnel Plans

The tunnel is a horseshoe-shaped straight bore, 9 feet 5½ inches in diameter and 20,334 feet long. The plans provided for an 8-foot 2-inch interior diameter to allow for a 6 to 9-inch concrete lining about 6,000 feet of which has been completed. In addition to this, between 2,500 and 3,000 feet will be gunited on the back and ribs.

The total rock excavation will be in the neighborhood of 56,000 cubic yards, the grade is 0.25 per cent, making the east portal 50 feet lower than the west portal. The tunnel is worked from two faces with one heading at each of the portals.

Drilling and Blasting

It has been impossible to standardize on a single drilling round for the entire tunnel, because of the widely varying nature of the rock. The typical round illustrated was devised by Frank J. Kane, tunnel superintendent. The cut



A Typical Round Used in Tunnel. Figures Refer to Order of Firing.

holes were drilled 11 or 12 feet, the No. 1 delay holes were 8 feet, while the side holes were drilled to a 9-foot depth using 10-foot steel. This round pulled approximately 8 feet of rock.

A 40 per cent gelatin Extra L.F. dynamite was used, and the average round was loaded with a charge of 160 to 190 pounds although it dropped as low as

68 pounds and went as high as 235 pounds.

The second cartridge from the bottom of the hole was the primer cartridge. The holes were loaded to within 2½ feet of the collar and no stemming was used. The 26 holes of a single round were primed with Hercules all-metal delay electric blasting caps which were fired from a 440-volt line. These new delay electric blasting caps were

(Continued on page 22)

Bucyrus-Erie Co. Moves New York Office

Bucyrus-Erie Co., South Milwaukee, Wis., moved its New York offices on April 1 from 270 Broadway to the thirty-sixth floor of the RCA Building, Rockefeller Plaza. J. C. Alexander is Eastern Sales Manager in charge of the New York Office.

P E N N S Y L V A N I A



Pennsylvania is one of the leading States in the construction of modern concrete roads. In a single year (1930) FLEX-PLANES were used on 119 projects for installing contraction joints to control cracks and produce a traffic guide line. Travelers often comment on the fine work and straight joint lines.

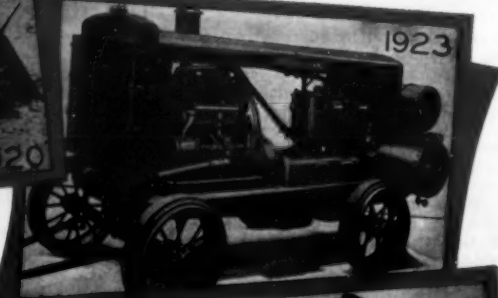
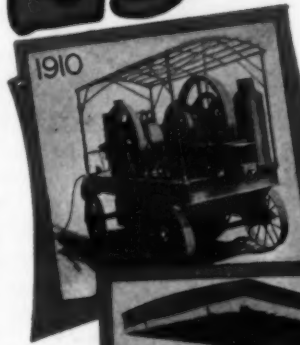
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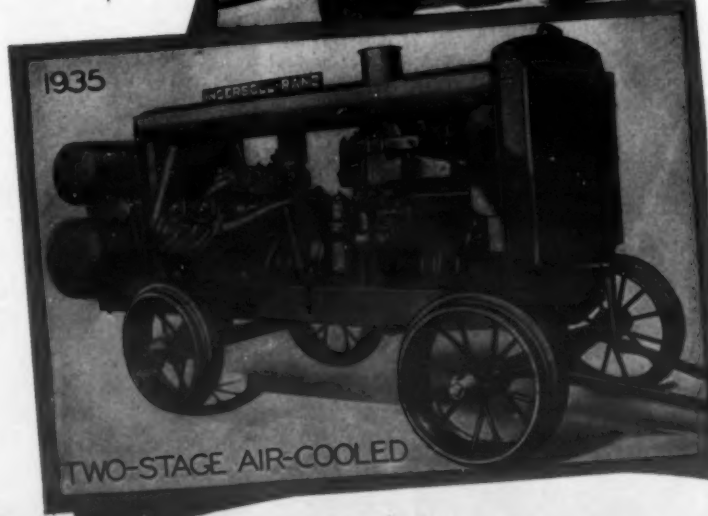
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There are seven sizes, obtainable for gasoline-engine or oil-engine-drive, which are intended for a working pressure of 100 pounds per square inch. These range in capacity from 30 to 420 cu. ft. per minute (actual delivery). There are also sizes for higher pressures. A variety of mountings enables the purchaser to secure a unit which will exactly answer his requirements.

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Edited by A. L. H. STREET, Attorney-at-Law.

Danger in Threats To Prosecute

Contractors who enjoyed Will Rogers in his picture, "Young as You Feel," may have approved his act in compelling the villain to turn over to the heroine \$40,000 he owed her, by threatening to have the swindler arrested. But if any contractor be thus inspired to use similar means to make an embezzling employee or some other crooked debtor disgorge, we suggest that the contractor at least omit invitations to Tom, Dick and Harry to come in and hear the threat made.

Evidently, our hero did not know that he was committing a felony—blackmail—when he forced the villain to indorse a draft for \$40,000 by threatening to have warrants for his arrest served upon him. Nor did he seem to realize that by inviting everyone in the neighborhood to come in and witness the unveiling of a worthless "monument sold" to the villain, he was supplying thirty or forty witnesses to his own commission of a felony.

One who is disposed to collect debts under threats of prosecution will do well to make the threats to the debtor in private. Better yet, he will leave it to his lawyer to let the debtor understand what is apt to happen if the latter does not pay what he owes.

Limits on Supervising Engineer's Authority

"Has the engineer a right to bind the owner by agreeing to this?" is a question that every contractor should ask himself every time that an engineer directs the doing of work not contemplated by an original contract. It is easy to assume inaccurately that the engineer stands in the shoes of owner in every instance.

To illustrate, a municipal contractor was lately denied right to recover for extra work authorized by the city engineer, because the contract required approval of the city council, which was not obtained. (New York Supreme Court, Appellate Division; *Bewley v. City of Lockport*, 263 N. Y. S. 109).

Custom as Element of Contracts

"Please pay us for the piling and lumber we furnished you for building those state highway bridges for the State," requested a lumber company.

"But the State has not paid us yet for building the bridges," replied the contractor. "It is customary in this neck of the woods for the material man to wait until the contractor is paid before expecting payment."

"We are not bound by any such custom, if it exists," rejoined the lumber company. "In the first place, the contract calls for payment to us within thirty days after delivery of the material. And it is well-settled law that a custom can never be proved to contradict the explicit provisions of a contract. A custom may be proved to give proper interpretation to a provision in a contract that is doubtful or ambiguous in its meaning, but never to contradict the plain wording of an agreement. And, in the second place, a custom must be reasonable, before it becomes an implied part of a contract. The custom you rely upon would defeat our right to recover under the statutory bond you gave the State as contractor, and is therefore unreasonable."

"The lumber company is right in its contentions," declared the Arkansas Supreme Court in the case of *National Lumber & Creosoting Co. v. Mullins*, 59 S. W. 2d, 493.

Federal Building Contractor Subjected to State Tax

"Please ante \$250 for the privilege of engaging in the business of contracting in Virginia," said the Commonwealth to an Illinois construction company.

"But we are not doing business in Virginia," demurred the company. "We are erecting a post office building in Lynchburg, but the site belongs to Uncle Sam and Virginia does not have jurisdiction over an inch of it."

"Yes, but how are you going to do the job without using the abutting sidewalks and streets, which belong to Virginia?" queried the Commonwealth. "And when you use them as an incident to performing your contract you are doing business in Virginia, although the completed building will stand wholly upon federal land."

"Commonwealth is right," declared the Supreme Court of Appeals of Virginia in the case of *Ralph Sollitt & Sons Construction Co. v. Commonwealth of Virginia*, 172 S. E. 290.

"Were it possible for the contractor to do the job without interfering with public use of the abutting streets, no valid tax could be levied. The contractor can not be taxed for mere use of the streets in common with the public, for transportation of materials, etc. But his shutting the public off from use of abutting sidewalks and streets and taking possession of the same for use in construction operations does afford a basis for taxation."

Question of Interest

"It is not merely a matter of interest, but of principle," might have complained the State of Washington had it been disposed to pun in the case of *Brewster v. State*, 16 Pac. 2d, 813.

A trial court had awarded judgment for more than \$18,000, and added to it interest on that amount at 6 per cent per annum since the job was completed. The Supreme Court of the state upheld the principal item, but struck off the interest allowance. The court followed the rule generally recognized by the courts throughout the country—that where there is a bona fide dispute as to how much money has been earned under a contract, no interest accrues before the amount has been liquidated by judgment. But interest would have been proper from the date of the completion and acceptance of the job, had there been no dispute as to the amount earned by the contractor.

Another point decided in the same case was that the contractor was not entitled to pay on account of overhaul eliminated by the state, where the contract called for payment on a unit basis and reserved right in the state to increase or decrease the quantities of work to be performed.

Liability for Faulty Work

Store building burned. Merchant having lease moved out. Landlord hired contractor to rebuild. Contractor rebuilt. Merchant moved back in. Building collapsed. Merchant sued Contractor for damages. Contractor defeated suit. Texas Court of Civil Appeals said (*Nedler v. Neece Lumber Co.*, 63 S. W. 2d, 403):

"After the completion and acceptance of a building, the liability of the builder [to third parties] for accidents caused by defective construction ceases and the liability attaches to the owner, whether the damages are attributable to his own negligence or to the negligence of the builder."

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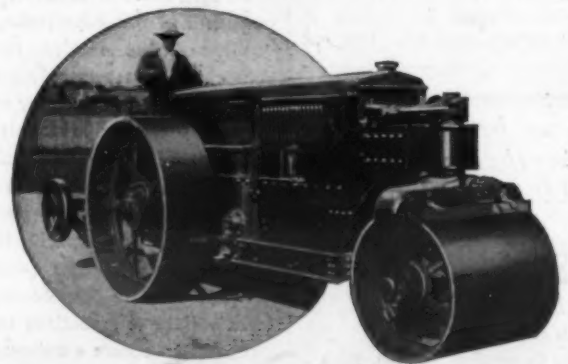
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HETHERINGTON AND BERNER INC
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\$22,000,000 a Year Urged for Minn. Roads

If Minnesota is to provide "reasonably adequate" highway service for the public on the expanded state system, an annual expenditure of approximately \$22,000,000 should be made on trunk highways.

This is the conclusion of experts of the United States Bureau of Public Roads who spent the past year making an exhaustive study of Minnesota's highway problems at the request of the Citizens' Interim Highway Committee authorized by the 1933 Legislature.

The \$22,000,000 annual expenditure which is recommended by Dr. Henry Trumbower, economist for the Bureau of Public Roads, and H. R. Briggs, statistician for the Bureau, for the present 11,300-mile trunk system is about the amount which was spent yearly on the old 6,700-mile system. If expendi-

tures on the enlarged system were made on the same scale as on the old system, the yearly amount would be more than \$36,000,000, the report states.

On the basis of state revenues existing in 1933 and 1934, with Federal Aid, the Highway Department would have only slightly more than \$13,000,000 a year income for the trunk system, Commissioner N. W. Elsberg estimates. If the Legislature provides sufficient additional revenues to match Federal Aid, this amount will be brought up to about \$20,000,000 a year, including the aid allowance of \$3,400,000.

As to the division of trunk highway costs between the large cities and the rural districts, the report states that in 1932, rural residents paid 33 per cent of the motor vehicle license fees and gas tax, while they accounted for 30 per cent of the traffic on the trunk system. The report concludes that the city areas contribute slightly less in trunk highway revenues than their proportion of travel would call for.

Regarding the general costs of the Minnesota highway system, the report says:

"Judged by similar states where studies have been made, the Minnesota highway expenditures in general are not abnormal, and those made by the local units of government, especially the towns, are low. The imposts against motor vehicles in Minnesota are less than those in adjoining states and in the country as a whole."

New Diesel Engines with 100 to 150 Hp

One of the features of the new diesel engine recently announced by the Murphy Diesel Co., Ltd., Milwaukee, Wis., is the new fuel injection system which combines the fuel pump and nozzle and is placed in the center of the cylinder head, surrounded by four valves. This injector unit is actuated directly by two camshafts, one on each side. Oil is delivered to the injectors

under 10 pounds pressure, surplus oil being returned to the fuel tank. Actual injector pressure of the fuel into the combustion chamber ranges from 2,000 pounds at idle speed to 4,500 pounds at maximum rpm, this pressure being concentrated in the tip of the injector.

Other features of this new 6-cylinder 5 $\frac{3}{4}$ x 6 $\frac{1}{2}$ unit are gasoline starting with auxiliary fuel burned within its own combustion chambers; oil-tight and dust-tight construction; improved cooling and lubrication system with water and oil pumps mounted directly on the crankshaft; oil-bath Donaldson-type air cleaners built into the inlet manifold to form an integral part of the engine; centrifugal, flyball-type governor, controlling a hydraulic servo motor which permits control of speed variations from full load to no load; and general symmetrical design.

The first of this new line of diesels is the MD-6 of 100 to 150 hp, which will be followed later by smaller engines.

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Out where men face rugged facts. Where men and machine buck tough jobs and stay with them—see them through. It's out there that engineers see the stamina of the Link-Belt. In such places the machine that's built right carries on to the finish—efficiently, and saving money by dependable performance. The Link-Belt Shovel, Crane and Dragline sell themselves best in action.

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Compacting Road Surface With a Bros Oilmix Roller

Compacting the Surfaces of Oil-Mix Roads

Every highway engineer has been faced with the problem of preparing oil-mix pavement surface so that it would not be cut, rutted, and thrown by speed traffic. The compaction method generally used, that of opening the road to regulated traffic, gave rise to a device made by the Wm. Bros Boiler & Mfg. Co., Road Machinery Division, Minneapolis, Minn., for the purpose of compacting such surfaces.

The Bros rubber-tired Oilmix roller is a platform trailer mounted on nine tires, 7.50 x 15, staggered front and rear. The width across the rear tires is 5 feet, filling the distance between the dual tires of the largest truck. The platform is a steel tray bolted to the frame and covering a tank in the frame which will hold 2 tons of steel punchings. It is 6 feet wide, 7 feet long and 3 feet 3 inches high. The gross load permissible is 7 tons, including the roller.

This roller may be towed behind a truck, motor patrol or pneumatic-tired tractor and compacts the surface of fresh or disked oil-mix pavement. The roller plus the dual tires of the towing truck cover a path almost 8 feet wide and it is claimed that three trips of this unit over each portion of the road gives a smooth compacted surface, sealed against penetration of moisture and ready for use by traffic.

This roller may also be used to compact disintegrating shoulders of oil-mix roads a year old, or to roll roads which have been torn up by disk and bladed out without re-oiling.

Zinc Dust Paint for Many Uses

Metallic zinc powder industrial paint, designed as a primer and finishing coat for iron, steel and galvanized surfaces to protect them against rust and corrosion, is described in a new booklet recently issued by the New Jersey Zinc Sales Co., 160 Front St., New York City.

This paint, which is claimed to withstand sudden temperature changes and various climatic conditions, will also completely obliterate in one coat any background of color.

Copies of this booklet may be secured by interested contractors and engineers direct from the company.

Bulk Cement Batching Plant for Sale

One factory reconditioned and guaranteed plant, consisting of 250-bbl. Beaumont bin, 40 bbl. per hour Sprout-Waldron screw conveyor unloading and elevating unit, complete with gasoline engine, roller chain drives, air compressor and generator. Price \$1200, f.o.b. Muncy, Pa. Sprout, Waldron & Co., Inc., Muncy, Pa.

Two Air-Cooled Stages On V-Type Compressor

With the compressor cylinder arranged in two banks in a true V with a special baffle immediately back of the fan which puts the cooling air on and around the cylinders and not between them, a new line of Plus Portable two-stage air-cooled compressors has been announced by the Sullivan Machinery Co., 814 Wrigley Bldg., Chicago, Ill. These compressors are made in four sizes, 105 cubic feet, 160 cubic feet, 210 cubic feet, and 315 cubic feet.

The design allows complete inspection of both intake and discharge valves, the entire piston head and the cylinder walls. Sullivan Micro-Lift valves with large area and light weight eliminate valve pounding.

The inter-cooling is said to be so efficient that the hand can be held comfortably on the high pressure intake. All gasoline-powered models have Buda engines. Model 105 is gasoline-powered

only and Models 160, 210 and 315 are supplied with either gasoline engines or Caterpillar diesel engines.

2-Yard Shovel-Dragline Excavates for Aqueduct

(Photo on page 44)

Work on Sections 20 through 23 of the Colorado River Aqueduct near San Jacinto, Calif., which was awarded to the Griffith Co., Los Angeles, Calif., for approximately \$1,700,000, involves the excavation and construction of about 12 miles of aqueduct between San Jacinto and Riverside. The excavation includes both rock and dirt cut for a ditch approximately 30 feet wide and 15 feet deep.

Excavation is being done by a Lima 801 combination shovel and dragline of 2-yard capacity, powered by a Waukesha Hesselman diesel oil engine, recently purchased from Smith Booth Usher Co., equipment distributor of Los

Angeles. This is the first Lima shovel of this size to operate in Southern California.

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As pioneer in the field of specialized lubrication, Alemite has developed *Extreme-Pressure Lubricants* that meet and actually exceed the most rigid specifications of equipment manufacturers—Alemite *Temprite Lubricants* that assure an *extra margin of safety* against repairs—*give fully 200% plus protection* for every moving part. This remarkable series includes new and improved *Tractor-Roll lubricants*, and lubricants which assure positive lubricating efficiency in extremes of heat and cold in plain or anti-friction bearings and all types of gears. Regardless of the extent of your operations you can get visual proof of their money-saving, repair-preventing efficiency. Remember: *Visual proof*. Send in the coupon now.

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Concreting Plant for Apalach. Bridge

(Continued from page 1)

are supported on 22 piles for each footing. These are untreated piles driven 50 to 55 feet below mean water level and cut off to about 30 feet in length. Over them a seal of tremie concrete was poured from the floating concrete plant of Doullut & Ewin which will be described in a subsequent article. All other concrete for this contract was similarly furnished. The seal varied in thickness from 12 feet to 16 feet 6 inches. After the seal had been poured and allowed to cure for a few days, the cofferdam was pumped out and the piles cut off in the dry one foot above the seal.

The steel sheet piling for the cofferdams for these piers consisted of 180 lengths of Carnegie, M-106, 60 feet and over in length, and 84 pieces of Larssen No. 3 section 60 feet and over in length. There were 16 corner sections for the first and 8 for the second. Two McKiernan-Terry No. 7 double-acting steam pile hammers were used for driving the sheet piling and a No. 9B3 of the same make for the foundation piling. A Vulcan No. 400 pile extractor was used for pulling the sheet piling. The river bottom at the pier sites was chiefly fine sand and silt.

After the cofferdams had been sealed and pumped out all other work was in the dry. The footings varied from 3 to 4 feet in height, on top of which was poured the pier proper consisting of semi-circular noses on the outsides and rectangular sections toward the center. The slender piers measuring 5 feet 6 inches both ways at the base and tapering on a batter of 3/8-inch per foot to 3 x 3 feet under the bridge seat varied in height from 39 to 48 feet. The pairs of columns of the piers were tied together by a cross beam 2 1/2 feet wide by 5 feet deep and 20 feet long at about 5 feet above water level and another concrete beam 5 feet deep under the coping.

The Swing Span Pier

The swing span pier built similarly to the other eight piers within a steel sheet piling cofferdam is circular and built on 134 untreated piles with a seal 17 1/2 feet thick carried down to 42 feet below mean water level. The swing span pier is 34 feet wide, with circular ends of 15 3/4-foot radii. The footing is 4 feet high with a mattress of 7/8-inch reinforcing bars on 8-inch centers in both directions, placed 3 feet above the cut-

off of the foundation piles and 9 inches below the center of the footing course. The pier base is 25 feet in diameter and of cellular construction with the outside wall 2 feet 6 inches thick, the four intersecting web walls 2 feet thick and the central column formed by them 6 feet square. The bridge seat course 2 feet thick has a 6-inch fillet.

Quantities

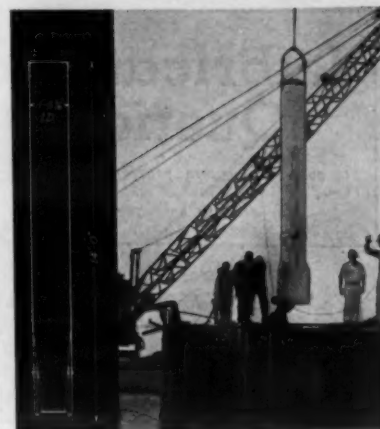
Pier 5, the Pivot Pier of the Swing Bridge	
Seal concrete.....	487 cubic yards
Class AA concrete (for use in salt water).....	588 cubic yards
Reinforcing steel.....	8,270 pounds
Untreated wood piling.....	5,360 feet
Pier 3, Typical of the Other Seven Piers	
Seal concrete.....	147 cubic yards
Class AA concrete (for use in salt water).....	97 cubic yards
Reinforcing steel.....	12,460 pounds
Untreated wood piling.....	1,600 feet
Total Quantities for All Concrete Piers	
Class C seal concrete.....	1,600 cubic yards
Class AA concrete (for use in salt water).....	1,443 cubic yards
Reinforcing steel.....	107,000 pounds
Untreated piles for foundations.....	18,500 feet
Crossed structural timber in fenders.....	56,000 feet BM
Crossed timber piling in fenders.....	9,600 linear feet

The spans for the bridge structure between the piers vary from 66 feet 6 inches to 83 feet. The bridge deck is

carried on I-beam stringers. Six coats of brushed-on bituminous waterproofing were applied to the pier columns up to the underside of the coping.

Floating and Other Equipment

The floating equipment on this contract consisted of five barges measuring 30 x 100 x 7-foot draft, on two of which were mounted stiffleg derricks and the remaining three were used for materials and service. The 5-ton American derrick had an 84-foot boom and was operated by a 2-drum Lidgerwood hoist and the barge carried a 40-hp Lookout boiler and a 40-hp Mundy auxiliary boiler. The 10-ton derrick had a 90-foot boom, a 3-drum Lambert hoist and the barge carried an 80-hp Walsh & Weidner boiler and a 40-hp Lambert boiler as auxiliary. A 1-yard Owen clamshell bucket was used for cleaning out the cofferdams and was carried by the derrick barge engaged in that work at the time. There were two 1-yard Insley bottom-dump, one 3/4-yard Blaw-Knox and one 3/4-yard tremie-type con-

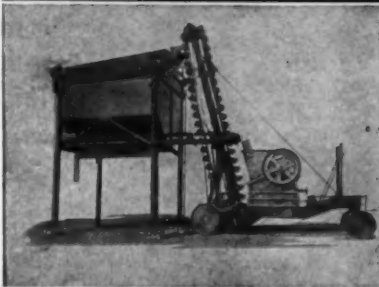


Cross Section and Photo of Elongated Roller-Gate Concrete Bucket Placing Concrete in Piers

crete buckets for the barge handling concreting and also 64 feet of 8-inch and 80 feet of 10-inch galvanized iron spiral tremie pipe. Later the tremie

(Continued on page 36)

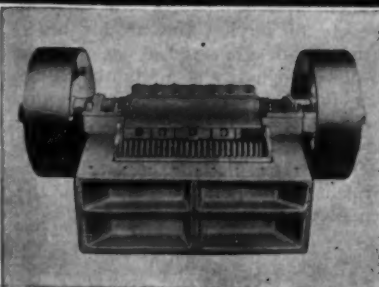
More *Greater* CAPACITY PORTABILITY AND LOWER MAINTENANCE COSTS ARE YOURS IN ANY CEDAR RAPIDS PLANT YOU BUY



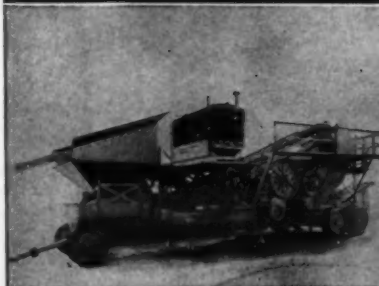
CEDAR RAPIDS STONE SIZING PLANT

WHATEVER YOUR REQUIREMENTS MAY BE IN THE MATERIAL PRODUCING OR HANDLING FIELD, YOU WILL ALWAYS FIND A CEDAR RAPIDS PLANT THAT WILL DO A BETTER JOB.

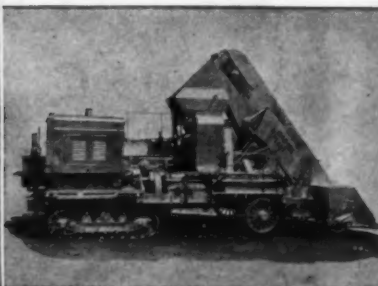
ASK FOR OUR CATALOGS AND BULLETINS BEFORE BUYING.



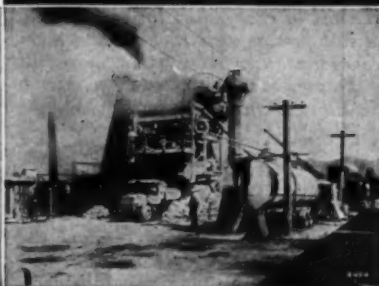
CEDAR RAPIDS JAW CRUSHER



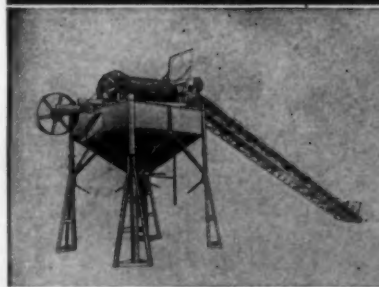
TANDEM STRAIGHT LINE PLANT WITH DIESEL POWER



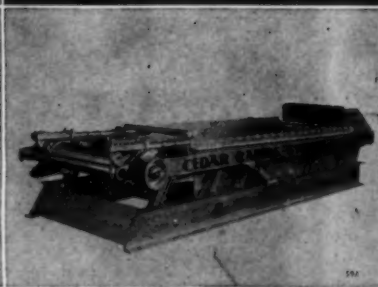
TRAVELING ROAD MIX PLANT



STANDARD CEDAR RAPIDS ASPHALT PAVING PLANTS



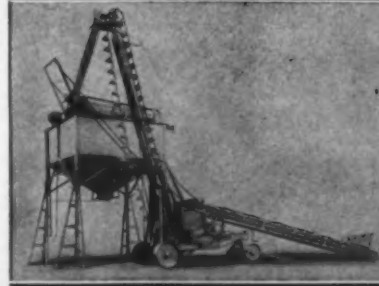
SCREENING AND LOADING PLANT



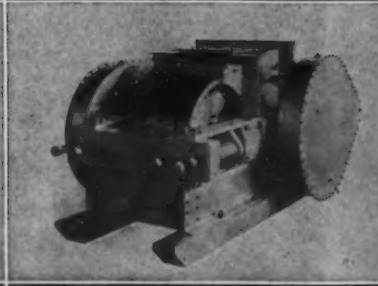
CEDAR RAPIDS SYMONS VIBRATOR SCREEN



PORTABLE WASHING PLANTS



PORTABLE QUARRY OR GRAVEL PLANT



CEDAR RAPIDS ROLL CRUSHERS



PORTABLE PRIMARY CRUSHER



23

20' Spread, 1/2" Chips
Backward or Forward

KOB Disc Spreader patented 1929

Spreads sand, gravel, chips, shale, cinders, or chloride.
A smoother job with more coverage, and varying widths.
Fits any dump truck, large or small.

Write for further information

KOB MFG. CO.

329 E. Brown St., Milwaukee, Wis.

IOWA MANUFACTURING COMPANY
CEDAR RAPIDS, IOWA

Lubrication Queries

Is some lubrication problem bothering you? Tell us about it and we shall be glad to help you.

Question

We have had to have an unusual number of visits from service men lately because of breakdowns and "freezing" bearings. Several times they have told us that the trouble has been in the lubrication of these bearings. We have always used plenty of oil and grease and can see no reason why we have had so much trouble. Can you help us?—Detroit, Mich.

Answer

We could preach a sermon on the text you have so well stated. Following the old Yankee custom of answering one question by asking another, here's one for you. Why is it that contractors, who take a great deal of time in investigation before purchasing construction equipment valued at thousands of dollars, should give so little consideration to the type of oils used in their machinery?

In our series of articles in 1934, we stressed over and over again the necessity of buying the proper lubricating oils or greases for construction equipment. Quality at a slightly higher price than cheap inferior grades of lubricants is the best insurance against breakdowns and their attendant time losses. Always select the better grade of lubricant of proper consistency for the particular bearing.

Question

With our machines working three shifts a day we don't like to lay them off at the end of every shift for lubrication. Is it not just as well to lubricate them once every other day, using more oil and grease, than to give them just a little lubrication three times a day?—Oak Park, Ill.

Answer

Either of the extremes you suggest is bad. A mere "lick and a promise" means too little grease or oil and the chance that spent grease and oil will not be expelled by the fresh lubricant. On the other hand, the use of an excessive amount of lubricant at infrequent intervals is even worse. It is only the lubricant which actually reaches the bearings that can do its work. Oil merely poured over some part of the machine runs off, collects dirt, and performs no useful function.

Follow the definite instructions given in your service manual for the engine or machine you are using, both as to frequency of lubrication and as to the quality and quantity of lubricants to use. The time required to do this will pay large dividends in long life and continued efficient operation of your equipment. The manufacturer has made a careful study of the lubrication of his machines and has given you his best advice in the service manual because he is placing his reputation in your hands.

COMPLETE CUTTING AND WELDING APPARATUS

for all types of light and heavy work. Torches, tips regulators, hose, goggles, gloves, lighters and wrenches. Low prices—highest quality materials and workmanship.

Write for catalog

The Alexander Milburn Co.

1400 W. Baltimore St. Baltimore, Md.

Lehman Elected Chairman of Blaw-Knox Co.

At a recent meeting of the Board of Directors of the Blaw-Knox Co., Pittsburgh, Pa., Albert C. Lehman, President, was elected to the newly-created office of Chairman of the Board in appreciation of his thirty years of service to the company since its inception, the resolution of the Board stated.

Irvin F. Lehman, Vice President, who has also been associated with the company since its early days, was elected President and Frank Cordes was made Senior Vice President.

The following were re-elected: Chester H. Lehman, Vice President; Robert F. McCloskey, Vice President; George L. Dumbauld, Treasurer; H. B. Loxterman, Secretary; B. L. Hirshfield, Chairman, Finance Committee; Paul W. Klein, Assistant Treasurer; H. S. Strassburger, Assistant Treasurer and Assistant Secretary; and P. A. McCullough, Comptroller.

Protecting Wood Structures Against Decay and Termites

Those interested in wooden structures will find much valuable information in a new booklet just published by the Tennessee Eastman Corp., dealing with the protection of wood against decay, dry rot and termites. The booklet is entitled "Preservation with Eastman

NO-D-K" and takes up the various methods of preservation, setting forth definite recommendations for the different types of construction. Its pages are well illustrated with photographs and diagrams to make it easily understood. Copies of this booklet are available free to readers of CONTRACTORS AND ENGINEERS MONTHLY by writing to the Tennessee Eastman Corp., Kingsport, Tenn.



ROAD AND SHOULDER MAINTAINERS
SPREADERS FOR STONE, ASPHALT, AND CHIPS
CAR UNLOADERS CONVEYORS TRENCH FILLERS
ROAD AND STREET CASTINGS SECTIONAL CAST IRON PIPE
THE ROSS SNOW PLOW

BURCH SIDE-OF-TRUCK SHOULDER MAINTAINER

works road shoulders thoroughly at an average cost of 15c per mile. Get the facts on this proven way of making road maintenance dollars go farther.

THE BURCH CORPORATION, Crestline, Ohio

for BETTER ROADS at LOWER COST

THE WALKER has reserve power a-plenty—to fill the bucket to overflowing—hoist rapidly . . . swing the machine quickly. No time lost here—and no time lost in moving because, due to the walking traction, the machine takes the shortest path between working points. Investigate The Walker for your next job. Manufactured by Bucyrus-Monaghan Company, Chicago, Illinois.

action



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EXCAVATING, DRILLING, AND MATERIAL-HANDLING EQUIPMENT...SOUTH MILWAUKEE, WISCONSIN

Stabilizing a Road

The resiliency of a road is being pulled down by the action of the water to the surface. The plan referred to in the work is a method of surface absorption of limits of the cohesive

Run

Bank-run this type of road ago many considered superior but it has fines present detrimental may be ground is of no use by the insufficient size of clay, the fine within satisfactory sized gravel not particularly as far as it does cause. The clay is if it is sufficient necessity of able it is for a clay value or price more economical because required. A fines other pure clay most desirable which, compared, have more

There is a construction vehicle fully. When a new grade is existing road done by fine coarse aggregate shoulder and shoulder. is suitable bladed on must be hauled. The clay is lumpy; the or rolling have dry water ing done a material is packed. The brought from over the coarse material uses the the actual Mixing and forth tor, or by ordinary work must teeth do depth. T a most efficient equipment set at any of cutting material mix in la

After m is bladed If the we it should down until moisture prolonged supplied

Stabilized Roads a Real Job

(Continued from page 2)

The resistance of the soil particles to being pulled apart is known as cohesion; this might simply be referred to as the stickiness of the clay.

The plastic index of a material often referred to in papers on stabilization work is a measure of its range of moisture absorption within its dry to wet limits of plasticity; it is a measure of the cohesive properties of the soil fines.

Run-of-Bank Aggregate

Bank-run gravel gives good results in this type of construction. A few years ago many of these banks were not considered suitable for surfacing material but it has been found that the clay and fines present are desirable rather than detrimental. The fact that one bank may be graded differently from another is of no serious consequence because, by the introduction of some of the deficient sizes and the proper amount of clay, the finished product can be brought within satisfactory limits. The larger-sized gravel should be removed. It is not particularly detrimental to the road, as far as construction is concerned, but it does cause difficulty in maintenance. The clay in the subgrade may be used if it is suitable, thereby avoiding the necessity of hauling it in. If not suitable it is usually profitable to search for a clay which has a high cohesive value or plasticity index. It is usually more economical to haul a highly cohesive clay a greater distance if necessary because of the lesser quantity required. All clay soil banks contain fines other than pure clay, but it is the pure clay content which is needed. The most desirable clay soils are those which, coming from the bank, do not have more than 50 per cent silt.

Mixing

There are several methods of construction which are being used successfully. Where the work is being done on a new grade rather than stabilizing an existing road, the mixing can best be done by first depositing the gravel or coarse aggregate in a windrow on one shoulder and the clay on the opposite shoulder. If the clay in the subgrade is suitable it may be scarified and bladed onto the shoulder; if not, clay must be hauled from a suitable deposit. The clay should be pulverized if it is lumpy; this may be done by blading or rolling. The desirable condition is to have dry weather when the mixing is being done and some rains when the mixed material is being laid down and compacted. The windrows should then be brought from the shoulders and spread over the road in alternating layers of coarse material and clay. This distributes the material uniformly and makes the actual mixing more effective.

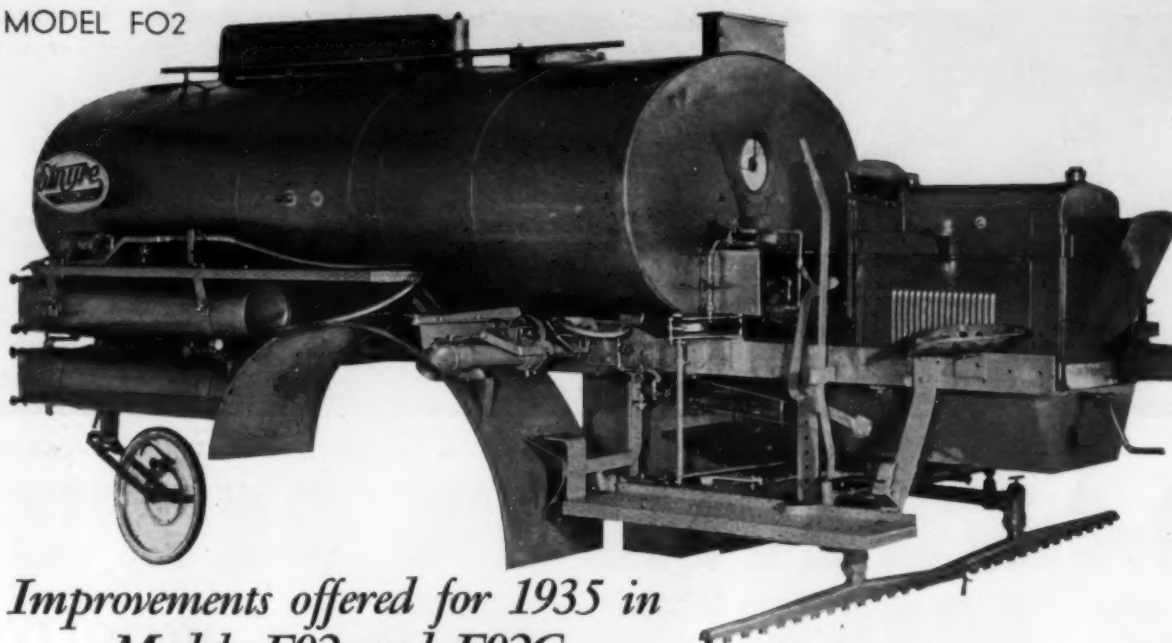
Mixing may be done by blading back and forth with a blade grader and tractor, or by a multiple blade drag or an ordinary harrow. With the harrow the work must be done in layers as the teeth do not mix effectively the entire depth. The heavy road disc harrow is a most effective and economical piece of equipment for mixing. The discs can be set at any desired angle and are capable of cutting through the entire depth of material so that it is not necessary to mix in layers.

Spreading

After mixing is complete the material is bladed to the shoulders in windrows. If the weather is extremely dry or wet it should be left there and not laid down until it has the proper amount of moisture to compact well. If there is a prolonged dry season the water can be supplied with sprinkling tanks. The

(Continued on page 25)

MODEL FO2



Improvements offered for 1935 in
Models FO2 and FO2C

ETNYRE

BITUMINOUS DISTRIBUTORS

NEW— A more compact assembly of pump, valves and circulating system, making insulation easier, allowing the valves to be readily heated from the motor exhaust, reducing the weight of the unit about 300 pounds, and permitting the distributor to be mounted 4 inches lower on the truck without reducing the road clearance of the spray bars.

NEW— Leakless valves, which eliminate the drip-drip which has up till now been so annoying to operators. These leakless valves are being enthusiastically received.

NEW— The fifth wheel driven tachometer, more accurate and satisfactory than one driven from either the front wheel or the transmission. On the way to and from the job, the fifth wheel is raised.

Have you a post-card handy? Just write on it: 504, with your name and address, and we'll send you promptly a copy of our Bulletin 504, which will give you a better, more complete idea of these two new ETNYRES. The same general design and principle of operation that have made the ETNYRE Model F so popular are retained, and we predict that because of their practicability and simplicity, ETNYRE Distributors will continue to be the standard for years to come.



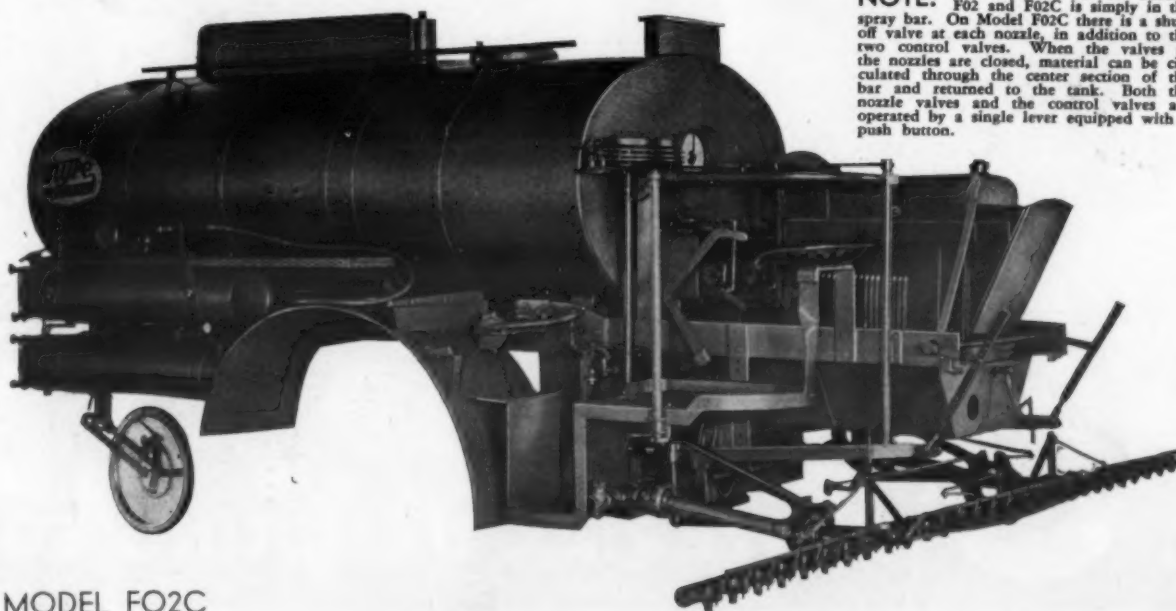
E. D. ETNYRE & COMPANY

DEALERS IN ALL PRINCIPAL CITIES

400 JEFFERSON ST.,

OREGON, ILL.

NOTE: The difference between Models FO2 and FO2C is simply in the spray bar. On Model FO2C there is a shut-off valve at each nozzle, in addition to the two control valves. When the valves at the nozzles are closed, material can be circulated through the center section of the bar and returned to the tank. Both the nozzle valves and the control valves are operated by a single lever equipped with a push button.



MODEL FO2C



At the Rattle Snake Dump, the 60-inch Stacker . . it is telescopically extensible 50 feet . . is equipped with a 150 ft. boom, caterpillar mounted to swing through 180 degrees

MOVING A MOUNTAIN A MILE WITH JEFFREY CONVEYORS

Two of the Jeffrey 60-inch Conveyor Lines (below) leading to the dump . . they travel 600 feet per minute . . handle upward of 4,000 tons per hour.



WORLD'S LARGEST CONVEYOR SYSTEM SPEEDS EXCAVATION AT GRAND COULEE

Dirt, more dirt, yet more dirt . . it's flowing fast from the Grand Coulee excavation. In 300 working days or less the last of some 14 million bank yards will be gone out, all carried by Jeffrey Conveying Equipment.

Seven large Heavy Duty Feeders, two self-propelled distributing Stackers and 2½ miles of Belt Conveyors designed and manufactured by Jeffrey accomplish this Herculean task, disposing of the excavated dirt and the filling of the cofferdam. The one system on the west bank alone handles 4,000 tons per hour. The rubber belts are carried on Jeffrey anti-friction Reliance and Hercules Idlers, operating continuously through three 7-hour shifts each day.

On your next job, large or small, call on us.

The Jeffrey Manufacturing Company

949-99 North Fourth Street, Columbus, Ohio
BRANCH OFFICES IN PRINCIPAL CITIES



A general view (below) of the excavation job . . showing Jeffrey Feeder Conveyors converging to Jeffrey Surge Feeder and Jeffrey Main Line Conveyor (right-background) climbing a mountain. The Jeffrey Conveyors breasting the piling are being used to fill the 3,000 ft. cofferdam. Well over a mile and a half of Jeffrey Conveyors are shown.



JEFFREY

MATERIAL HANDLING EQUIPMENT

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Are You Losing Profits Through Lost Time?

Conclusion of Studies of the Construction of Mixed-Bituminous Roads

WITH this installment we conclude this discussion of the factors causing time losses on bituminous road jobs and how such losses may be prevented. The conclusion presented by C. F. Rogers, Assistant Highway Engineer, U. S. Bureau of Public Roads, is that the prevention of time losses must begin with the designing and planning the job and must be followed through in every phase of the work, if there are to be any profits when the job is done.

Avoidable Delays Costly

The costs of labor and equipment are almost equal and together they produce approximately 40 per cent of the total cost. Elimination of time losses effects a direct saving in labor costs and also tends to reduce equipment costs but does not necessarily reduce the amount of equipment required. It should not be assumed that greater efficiency will adversely affect the employment of labor. There will be a decrease in the hours of labor per mile of road but the decreased costs will permit the construction of a greater total mileage and cause an increase in the production and transportation of materials and machinery.

Table 11 shows the amount and cost of avoidable delay for all projects combined by causes and includes both major and minor delays. Table 12 shows the amount and cost of such delays on each project. This dissipation of potential profit on all projects amounts to nearly 8 per cent of the cost of the projects. On one project delays arising from a shortage of hauling equipment resulted in losses equal to the cost of two 5-ton trucks. In another case bin delays caused a loss of \$6,000 when half of this amount would have provided facilities which would have completely eliminated this delay. Losses from insufficient dryer capacity have been found large enough to supply a battery of dryers. A contractor purchased a new asphalt pump to replace one causing delay and within a week the savings had offset the cost of the pump. These are typical examples of conditions found on many projects.

Think of Costs of Materials in Designing Mixes

Up to this point the discussion has dealt mainly with costs of labor and equipment which constituted 40.3 per cent of the total cost. Elimination of all avoidable delays would have reduced the cost of labor and equipment by 21.7 per cent, making them 34.5 per cent of the total cost. Such efficiency is within the reach of the average contractor who will then have 65.5 per cent of the total cost involved in materials. Under highly efficient management they may be much higher since on the most efficient project studied labor and equipment costs were 46 per cent below the average. It is evident that a discussion of economy in construction of mixed bituminous pavements must take into consideration the relative quantities and costs of the materials.

Use of local materials sometimes

This is to certify that the average circulation per issue of CONTRACTORS AND ENGINEERS MONTHLY for the six months' period January 1, 1935 to June 30, 1935 is 25,000.

EDGAR J. BUTTENHEIM.

Subscribed to and sworn before me this 10th day of April, 1935.

EDWIN WAGNER, Notary.

Table 11.—Cost of Avoidable Delays on All Projects by Causes

Cause of delay	Avoidable major delay	Cost of avoidable major delay	Avoidable minor delay	Cost of avoidable minor delay	Cost of all avoidable delay
	Hours		Hours		
Hauling equipment operation	44.0	\$1,549	613.5	\$37,208	\$38,757
Bins empty or overflowing			638.5	38,725	38,725
Handling material at plant	108.6	3,823	83.4	5,058	8,881
Lack of material at plant	149.5	5,263			5,263
Operative at plant			146.2	8,866	8,866
Moving at street	80.3	2,827			2,827
Miscellaneous	73.9	2,602	1.8	109	2,711
Lack of subgrade	75.2	2,647			2,647
Heating material at plant	47.7	1,680			1,680
Late start, management	45.9	1,616			1,616
Handling asphaltic cement and fuel			45.3	2,747	2,747
Finishing			44.4	2,692	2,692
Mechanical at street	31.6	1,113			1,113
Mechanical at plant	7.1	250			250
Total	663.8	23,370	1,573.1	95,405	118,775

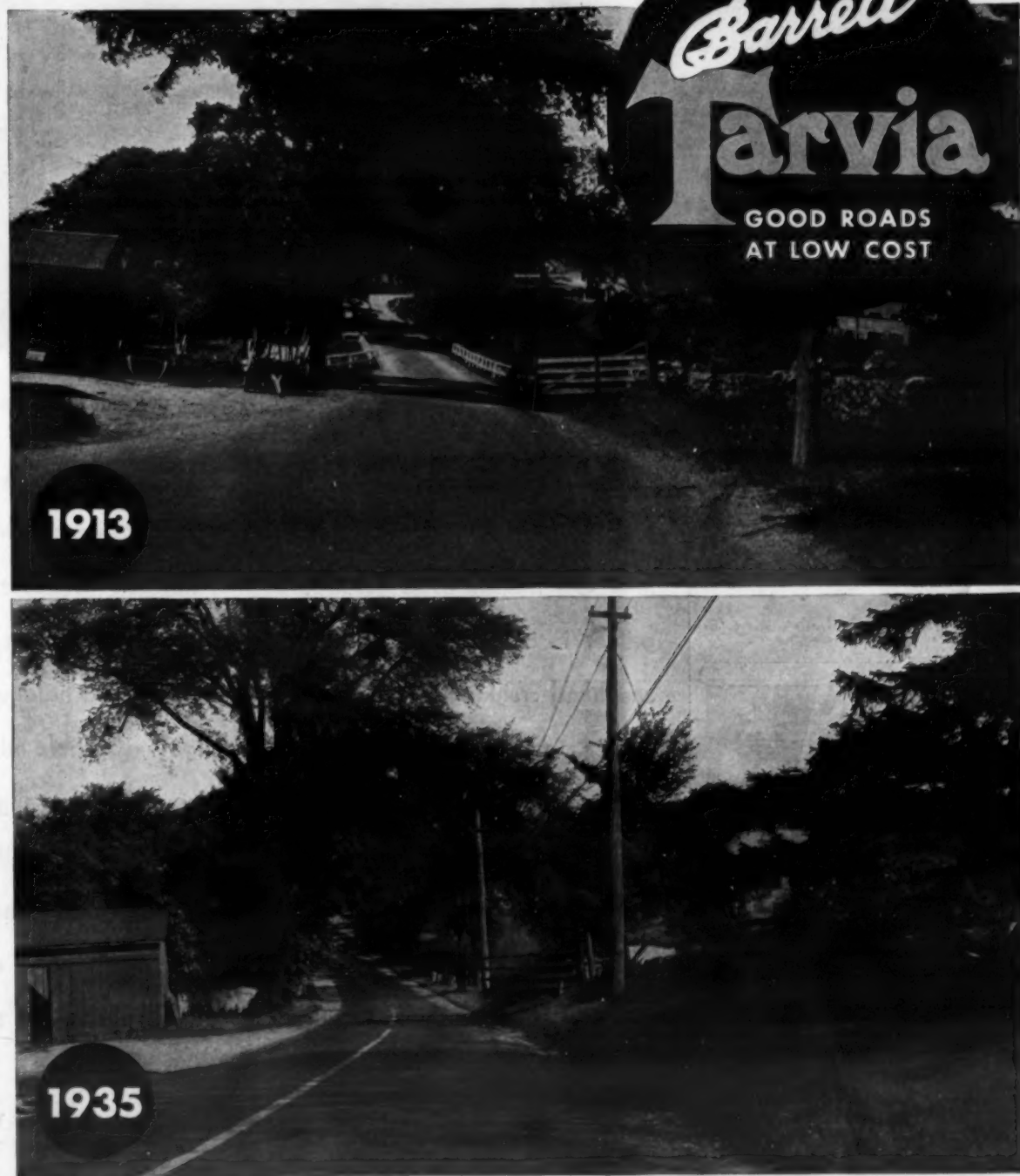
Table 12.—Cost of Avoidable Delays by Projects

offers the opportunity to make savings in their cost and in their transportation. There has been some tendency toward adopting this practice where conditions

are favorable. On two recent projects in the western states four sizes of aggregate were produced from local deposits with excellent results. In each case a

semi-portable aggregate plant of considerable size was installed and the output was sufficient to care for the maximum production of the mixing plant.

Grafton Road, Massachusetts, on route from Worcester to Providence. Tarvia-built in 1913, before the World War, this Tarvia road remains as smooth, easy-riding and skid-safe as it was the year it was laid.



To road officials and highway engineers traffic-safety of a road is equally as important as its durability and low cost. Tarvia roads qualify on all counts. Tarvia penetrates deeply into the road crust, holding the stone or gravel firmly exposed on the road surface. The resulting slightly granular surface, which is characteristic of Tarvia road types, provides an effectual tread-hold for automobile tires. Let the Tarvia field man help you provide safe roads.

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A Planned Program of National Highways

Of late we have heard a lot about a planned national highway program. This is merely our old friend in a new suit of clothes. Highways, unlike many other public works activities, have been well planned. For a great many years the states in cooperation with the Bureau of Public Roads have been developing plans and programs for highways, covering all phases of construction and development. Many of these plans are based on intensive transportation surveys and in practically every case the results of these surveys justify to the fullest degree the plans and designs of construction already undertaken.

It has been intimated that a new agency may undertake the work of planning a national highway program. While such a program is highly essential to insure economic progress in developing our highway system, why duplicate work already largely accomplished? The several states in conjunction with the Bureau of Public Roads already have developed such a plan. Future studies will continue to improve this plan and to coordinate other public works projects and transportation systems. There is no agency so completely qualified and with such a wealth of experience to continue this work as the U. S. Bureau of Public Roads.

We have only to analyze the accomplishments of the state highway departments and the Bureau during the period immediately following the passage of the National Recovery Act to see that no highway planning can be undertaken without utilizing the experience and facilities of the Bureau and the state highway departments. In spite of the fact that new phases of work, new at least to the state highway departments, were brought into the picture, detailed programs and plans from nearly every state in the Union poured into the Bureau of Public Roads.

This alone justifies the statement that highway planning should be undertaken by the now existing agencies, the Bureau of Public Roads and the state highway departments, which have already contributed so much to our present highway system.

—From a paper by H. C. Whitchurst, presented before the American Road Builders' Association.

AMERICAN GOPHER SHOVEL
The 1 1/4 Yard Model 450
"ON THE JOB"



We invite you to send for our new, interesting Free rotogravure magazine "American Gopher Shovels" Illustrated.

Write to



AMERICAN HOIST & DERRICK COMPANY
SAINT PAUL MINNESOTA

New Pump Catalog

A new 32-page catalog No. 35 covering the complete line of Sterling Quality self-priming centrifugal pumping units has recently been issued by the Sterling Machinery Corp., 411 Southwest Blvd.,

Kansas City, Mo.

This company has recently brought out a complete line of self-priming centrifugal pumps arranged for belt drive, which are described in this catalog. It also contains complete information on the individual models designed

for gasoline power or electric motor and in addition contains considerable engineering information of interest to contractors and engineers.

Copies of this catalog may be secured gratis direct from the Sterling Machinery Corp.



CMC Has What it Takes!

- A Complete Line To Pick From
- Modern Design — Lower Prices

Investigate

Wonder Tilting Mixers, Hoists, Pumps, Wheel Barrows, Master & Silverstreak Drum Type Mixers, Saw Rigs, Plaster and Mortar Mixers, Concrete Carts.

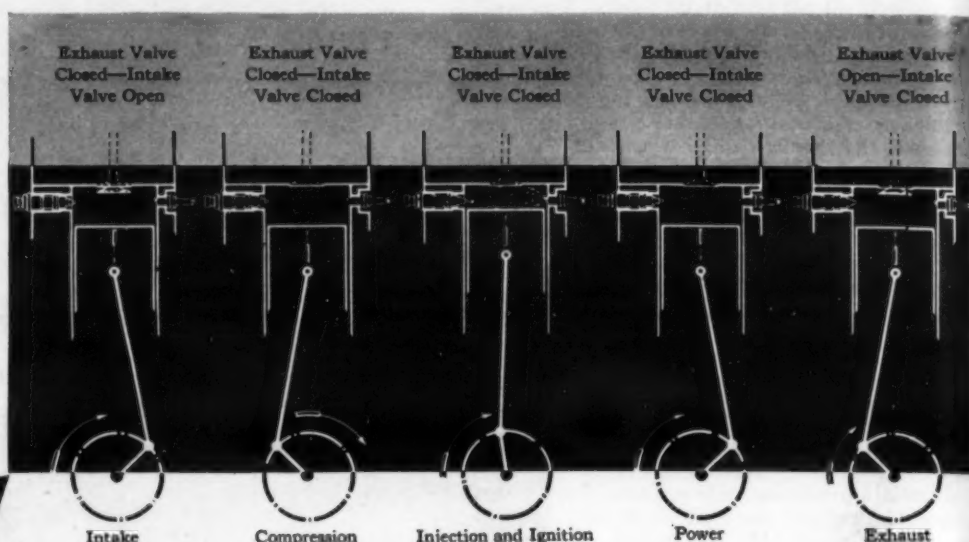
Write For Free Descriptive Bulletins

CONSTRUCTION MACHINERY COMPANY

500 Glenwood St., Waterloo, Ia.



Diagram of the Hesselman Cycle



Why

THE HESSELMAN STARTS EASILY

It is as easy to start a Waukesha-Hesselman Oil Engine as a gasoline engine. A primer is used as with a gasoline engine and hand cranking is just as feasible. The primer atomizes and sprays a small charge of priming gasoline into the air intake manifold. And the charge flows readily into the cylinder through the overhead valves.

The cup shaped Hesselman piston head, which forms the combustion chamber, catches and retains any excess priming charge. And it is burned instead of de-

stroying the cylinder wall lubricating film.

The Hesselman piston head is designed with extra metal. This aids in supplying and holding sufficient heat to insure a combustible mixture at the spark plug. As soon as the engine fires, it begins to function on fuel oil. Even in the coldest weather, a Hesselman requires no more priming,

nor any longer warm-up period than a gasoline engine.

Write for Bulletin 1000.

Waukesha Motor Company,
Waukesha, Wisconsin.



The location of the rings provides an unobstructed path for heat flow from the head to the skirt.

THIS IS NO. 4 OF A SERIES on the Hesselman Oil Engine. No. 5 will appear next month. A reprint of the complete series will be mailed on request.

WAUKESHA ENGINES

Maintenance Men Are Born, Not Made

A number of new developments in maintenance operations and a survey of the accepted methods were discussed by C. W. McClain, Engineer of Maintenance, Indiana State Highway Commission, before the Twenty-First Annual Purdue Road School. Mr. McClain's comments on the phase of maintenance dealing with repairs follow.

Patching of Surface

This class of work is frequently neglected, allowing surfaces to become hazardous to traffic, and permitting failures to spread unduly over great areas. To assure proper methods of repair and to guarantee that the work be done at the right time, there should be properly equipped gangs for this work. Men with the ability to make uniform and smooth patches "are born, not made" and the crews should be chosen with care. Methods of patching with various materials are well outlined in literature of reputable manufacturers of such materials. The instructions for this work are presented in detail and if followed will result in satisfactory jobs. Because of the great increase in traffic speed, shoulder patching should receive the same care and attention as the driving surface.

Replacement of Structure Parts

One of the favorite exercises of motorists is battering the end posts of steel bridges. We have found that it is safer and more economical to let the furnishing of steel and its installation to steel companies familiar with this class of work.

Guard rail posts of either cable or rail should be replaced immediately. The very fact the guard rail was hit at a particular location is good evidence it is liable to be hit again at the same place. Repairs of this nature should be made promptly. Such promptness may save a life. Bridge floors ought to be repaired at once and, if replaced, attention is called to the desirability of using creosoted lumber, if lumber is used. Its added life, due to treatment, is well worth the difference in cost. Again it should be stressed that a "stitch in time saves nine." Also keep equipment well lubricated and painted.

N. H. Good Roads Assn. Elects Officers

Wallace F. Purrington of Concord, N. H., was elected President of the New Hampshire Good Roads Association at its annual meeting held in Concord. Other officers elected were: Fred W. Lang, City Engineer of Concord, Vice President for two years; Frank D. Sleeper of Lakeport, Secretary-Treasurer.

South Bend

**Bituminous Pressure Distributors
Street Flushers
Street Sprinklers**

Literature and prices on request

MUNICIPAL SUPPLY COMPANY

SOUTH BEND, INDIANA

urer; Leroy F. Johnson, Maintenance Engineer, State Highway Department, and J. Harold Johnson, Secretary to the State Highway Commissioner, Directors for two years.

Other officers elected last year for two-year terms and who continue in office are: Hartford Nay, Division Engineer, State Highway Department, Vice President; Harold Ingham of Concord and Austin Page of Concord, Directors.

Republic's N. Y. Office Moves to New Quarters

The New York District Sales Office of the Republic Steel Corp. has moved from the Lincoln Building to new quarters in the Chrysler Building. W. H. Oliver continues in charge of the office as District Sales Manager. The Export Department, under the direction of D. H. Bellamore, General Export Manager, will also occupy a portion of Republic's new suite in the Chrysler Building.

Better Rural Roads

Poets have long pointed out that spring brings thoughts of romance, flowers that bloom, the awakening of nature and all that sort of thing. Spring also brings thaws, freshets and with them rutted, muddy country roads, often times impassable, in sections where the farm-to-market route is of great importance to the community.

Fortunately, progress in road building has made the vision of good roads a reality and it is possible to build and maintain hard-surfaced rural roads. Stable all-weather roads, developed through soil studies by the U. S. Bureau of Public Roads, and constructed by the proper mixture of local materials and calcium chloride, are inexpensive in first cost and greatly reduce the cost of maintenance.

Hundreds of miles of such roads have already been constructed, principally in Michigan, Indiana, Minnesota and Ohio, and the method of construction is rapid-

ly becoming standardized. Safe, hard-surfaced rural roads are a definite business asset to every community.

Price Only \$175

This machine weighs 140 pounds—easily transported to the job.



Resharpen Your Rock Bits with a Quick-Way Bit Grinder.

Resharpen them again and again at a cost of from 2c to 4c per bit.

C. H. CARLSON MFG. CO.
13-15 Main St. N. E. Minneapolis, Minn.



One of the CUMMINS Diesel-powered LINN Tractors owned by J. Robert Bazely, Inc., Contracting Engineers, Pottsville, Pa. Owner reports that fuel costs average less than 1/4 that of gasoline power.

Replace gasoline engines with

CUMMINS Diesel Engines

for superior power performance and
amazing economy

WHEREVER you now use gasoline engines—for automotive, portable and stationary equipment—CUMMINS Diesel Engines will do a better job, at a big saving in cost.

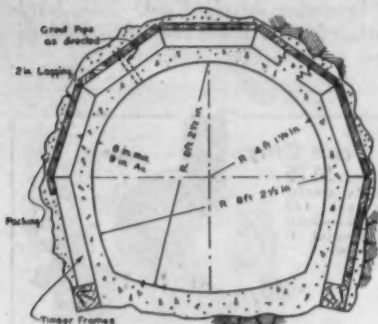
These modern, efficient Diesel engines have the "backbone" for the toughest jobs. They have greater capacity—they handle heavier loads—they speed up your operations. They give dependable, trouble-free performance at an amazingly low operating cost. A check-up with any user will confirm these facts.

Don't confuse CUMMINS Diesels with ordinary Diesels. CUMMINS pioneered in producing compact, high-speed Diesel engines to replace gasoline power. As a result, CUMMINS engineers developed many radical improvements in Diesel design, construction and operation. These important features are exclusive with CUMMINS Diesels.

CUMMINS offers a complete line of Diesels from 35 to 400 H. P. Ask us for complete facts. In writing, please list your gasoline-powered equipment.

CUMMINS ENGINE CO. —The Leader in Diesel Engineering Advancement **COLUMBUS, INDIANA**

• SALES AND SERVICE IN PRINCIPAL CITIES THROUGHOUT THE U. S. •



Tunnel Section

New Water Tunnel through Rockies

(Continued from page 11)

especially developed to speed up tunnel driving. They have no vents so that moisture can not get inside to cause misfires.

Four Cycles in 24 Hours

Three 8-hour shifts were worked at each face and four cycles were completed each 24 hours. From 2 1/2 to 3 hours after the mucking was finished were required to set up and drill a round and mucking was completed in about the same length of time. The total of 5 to 6 hours is very fast for setting up drills, drilling, blasting, ventilating, and mucking in a 9 1/2-foot tunnel, even under the best conditions.

Pneumatic Equipment

There were four Gardner-Denver No. 17 drills used at each heading, the top machine drilling the 12 holes above the center, while the bottom machines drilled the remaining 14 holes in the round. This procedure was varied in individual rounds, inasmuch as the rounds varied from 25 to 30 holes.

The contractor used 1 1/4-inch hollow round Crusca drill steel. After each shot, the steel car was pushed in and removed the used steel which was taken to the shop and resharpened on Gardner-Denver drill sharpeners.

Compressed air for the drills was furnished by two Ingersoll-Rand, Imperial XCB-2 compressors, driven by General Electric Type KT 200-horsepower motors. The face was ventilated by air supplied by a 15-horsepower American blower at each portal delivering through du Pont Ventube and Bemis Flexpipe flexible tubing.

Mucking

The face was mucked with a Sullivan 3-drum scraper hoist which was pulled up a slide so that the rock was loaded direct into 52-foot Koppel cars. Each heading had 20 of these side-dump, all-steel roller bearing cars which were usually sufficient for mucking one round. An O'Rourke switcher was used so that cars could be switched without a side track. Two Mancha Mules at each portal hauled the loaded muck cars to the dumps.

Concreting

The progress in concrete lining has averaged about 150 feet a day. Eight sections of 25 feet each of Blaw-Knox collapsible steel forms are used. The concrete is mixed outside and hauled into the tunnel in 1 1/4-yard rocker dump cars, eight to ten yards to a train. From the cars it is dumped on an elevating conveyor which feeds the hopper above the Pressweld concrete placer.

Personnel

O. R. Smith is Chief Engineer in charge of construction for the Twin Lakes Reservoir Canal Co., while Myron Beswick, General Superintendent, has been in active charge of the job for the contractor, with Ross R. May, Chief

Engineer, and Frank J. Kane, Tunnel Superintendent for both portals. Allan Rogers is Assistant Superintendent at the west portal and Lawrence Wright, Assistant Superintendent at the east portal. Platt Rogers, President and General Manager of Platt Rogers, Inc., spent considerable time on the job.

Still Much Work to Do on Our Highway System

Among the activities necessary to a balanced highway program, provision should be made for the following types of work, according to a paper presented by H. C. Whitehurst before the American Road Builders' Association.

1. Extension of the existing system

where traffic justifies, including the filling in of all gaps in the present primary system.

2. Modernization of existing conditions to insure safety and to meet traffic requirements adequately in an effort to relieve congestion.
3. Development of the secondary system consistent with traffic needs in an economical and sound manner.
4. Improvement of municipal main thoroughfares.
5. Maintenance of all highways to prevent rapid deterioration and insure safe operating conditions.
6. A reasonable program of replacement such as conditions justify.
7. Construction of footways along main highways, particularly in and

near metropolitan areas.

8. Roadside beautification to the extent of restoring natural beauty and preventing erosion.

Care of Safety Lines

Safety lines should be installed on all items of a floating plant as follows: a section of 3/4-inch hemp line should be spliced or otherwise securely fastened to each cavel or timber head. Overhand knots should be tied in the line at intervals of one foot. The section of line should be long enough to reach the surface of the water when the deck is at the highest point above the water it is likely to reach in ordinary service. When damaged or deteriorated from exposure these lines should be replaced.

Easier Starting

NO TIME LOSS GETTING STARTED ...

Watch an A-C Oil Tractor start out in the morning! A push on the starter ... or a couple of turns on the crank ... and away she goes! How can a tractor operating on diesel fuel be started so easily? Because A-C Oil Tractors employ a new, improved system of engine operation—fuel is injected with a diesel pump and ignited with a spark.

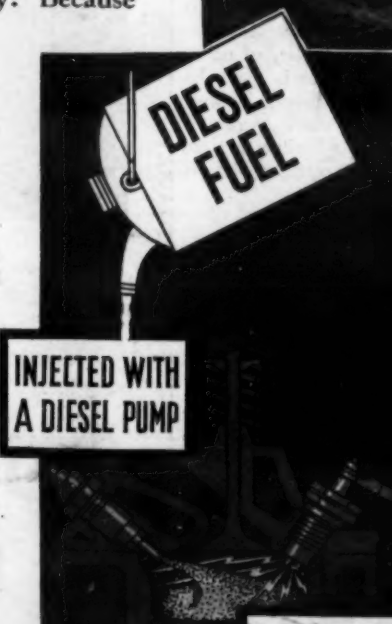
In starting, the A-C Oil Engine fires for the first few revolutions as a gasoline engine. Then it runs on diesel fuel oil, supplied by the injection pump and ignited with a spark. No warming up is necessary for the diesel fuel to fire—gasoline is used for only a few seconds while the engine gets up to speed.

Easier starting is just one of the reasons why buyers who get the FACTS are choosing A-C Oil Tractors. Operating with compression pressures from one-fourth to one-third those of the unimproved type ... A-C Oil Tractors deliver a smoother flow of power ... with less vibration and wear ... and fewer repairs. That is why A-C Oil Tractors are showing up competition—by doing the job at Lowest Final Cost.

ALLIS-CHALMERS
TRACTOR DIVISION—MILWAUKEE, U. S. A.

CLAIMS CAN'T BEAT FACTS

Lowest Final Cost depends on:
LOW FUEL COST
LOWER ORIGINAL COST
LOWER MAINTENANCE
LESS DEPRECIATION



Gives you:
EASIER STARTING
SMOOTHER OPERATION
LESS VIBRATION
FEWER REPAIRS

A-C
F O L O

Picks and Shovels

(Continued from page 1)

shut-downs at the plant, and the quality of their work fell off.

The Superintendent talked it over with the Foreman and finally came to the conclusion that in half an hour no one could lose much at penny ante, particularly at the slow pace they played and with long interludes of kidding. The ban was lifted and what a change in the men! They worked twice as hard, smiled at their work, and got twice the fun out of the game down behind the machine shop.

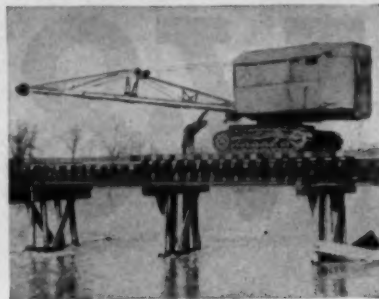
Maintaining County Roads

Gravel, slag, stone or cinder roads must be dragged regularly unless they have had a bituminous treatment. Some of the less important roads may not require more than one dragging a month while the most important ones may require three or four draggings a week.

A multiple blade maintainer pulled by a tractor is the most suitable equipment for this work. Small road drags and power graders and truck scrapers are used to augment the maintainers during certain seasons when extra work is necessary. A light resurfacing of a fine gravel is required from time to time to replace the worn out material.

Paved road surfaces require constant attention. Holes which develop must be broken out and patched. Settled places are brought back to grade by forcing mud under the slabs. Expansion joints and contraction cracks must be well sealed with bituminous material to prevent serious damage to the pavement from water and ice.

Neglect of this will soon make more expensive repairs to the pavement necessary. The use of a bituminous premix has proved very satisfactory for the repair of small holes and depressions. A portable asphalt plant is now used for the mixing of this material, by Wayne County, Mich. This has resulted in considerable saving compared to previous methods.



Crossing a Railroad Trestle with a Crawler Crane.

Not As Easy As It Looks

Crossing the White River on a railway trestle only 10 feet wide with crawlers 9½ feet wide has its thrills, according to Eddie Leak, dragline operator for the C. E. Jefferson Co., of Indianapolis. Rotating a series of 12 x 12 timbers astride the rails to form a solid footing for the 24-ton P & H machine, straight travel and perfect balance were necessary all the way to avoid a nose dive into the flood below.

Grinders for Rock Bits

The Quick-Way grinder for detachable rock bits, manufactured by the C. H. Carlson Mfg. Co., 13-15 Main St., N. E., Minneapolis, Minn., is made in two standard sizes, either one sufficiently large for grinding all sizes of rock bits. Model G is designed for moderate production and Model LG for high production, operating with two men if desired.

Model G, which is particularly adapted to contractors and portable work, is powered by an AC 60-cycle 110 or 220-phase, ball-bearing, 3,600-rpm dust-proof motor. The grinder is designed for dry grinding and the grinding wheels are constructed for speedy and efficient service. It is claimed that any style or make of bit can be resharpened in from two to four minutes. Model G has a net weight of 140 pounds.

Model LG, with a 2-hp motor, is more adapted to permanent jobs or jobs running over a greater period. This model is equipped with guards over the grinding wheels so constructed that a suction blower can be mounted to take the dust away from the operator. The slides are adjustable and ways are fitted with gibs to compensate for any wear.

It is claimed that the Model LG resharpens bits in about 1½ minutes. Both models index the bits which makes all cutting edges the same height and is claimed to give longer life to the bits and lessen the strain on the steel rod that extends from the bit to the hammer.

Highway Department Employed Farmers

Farmers and teams were hired by the Minnesota State Highway Department to drag secondary roads which would not support motorized equipment during the spring break-up.

District maintenance engineers throughout the state were instructed to arrange with farmers in their territory for whatever help of the kind was needed. Included in the 4,500 miles of county roads taken into the trunk system last year are many miles not well enough constructed to hold up standard motorized equipment when the frost was coming out of the ground.

Load restrictions were also placed on many of the secondary routes, which were strictly enforced to prevent the roads from becoming entirely impassable during the spring.



COIL TRACTORS

LOWEST FINAL COST

V-8

Performance is saving time . . .

Economy is saving money for

CONTRACTORS



... AND HERE'S HOW TO PROVE **YOU** CAN SAVE TOO!

FROM all over the world come reports telling how V-8 Performance is saving time and speeding up service ... how V-8 Economy saves money in operating costs ... how owners are enjoying amazingly low maintenance and repair costs. Many owners report 100,000 miles of economical, reliable service. Hundreds more express their appreciation of the money-saving Ford Engine Exchange Plan and other parts exchange privileges ... advantages that assure low cost of up-keep.

Thus, Ford V-8 Trucks and Commercial Cars have proved in service the outstanding superiority of V-8 Performance, V-8 Economy and V-8 Reliability. Your Ford dealer is so proud of this record ... he is so confident that the 1935 Ford V-8 Trucks and Commercial Cars are the greatest ever to bear the Ford name ... that he invites you to make your own "on-the-job" test ... with your own loads ... over your own routes ... with your own driver ... and let you draw your own conclusions.

THE **FORD V-8** TRUCKS AND
1935 **FORD V-8** COMMERCIAL CARS

Stabilized Roads a Real Job

(Continued from page 17)

best results can be obtained by laying the material down, leveling and compacting in approximately 3-inch layers. Where it is available a tamping roller will produce better results than the ordinary road roller.

A sufficient amount of moisture is necessary in the material at all times to keep it in a compact, dense, impervious condition. Dry material will dust off under traffic in dry weather unless kept damp. On the other hand, clay alone or too much clay in a mixture with coarse material will become plastic in wet weather. Consequently, it is necessary to supply the moisture by artificial means in dry weather, and it is likewise important that there is not too much clay present in the mixture so as to cause trouble in wet weather.

Calcium Chloride Binder

Calcium chloride is used to supply the required moisture. There are two methods of using it; the integral mix and surface application. If the integral mix is used, 2 pounds of calcium chloride per square yard is applied to the top 3 inches of the mixed material. Following this not more than 1½ pounds per square yard of calcium chloride is spread over the loose top layer of mixed road material. The chloride should then be thoroughly mixed with the top layer of the material by any of the above methods and then spread, leveled and compacted. The surface should be maintained by blading and dragging for a few days until it is rather firmly compacted and should then be followed by a ½-pound per square yard surface application with calcium chloride.

If the surface application method is used the shaping and compacting of the top layer should be completed and the calcium chloride then spread on the surface at the rate of 1 to 1½ pounds per square yard. The surface method will produce best results if applied late in the day or after rains. After completing the application of calcium chloride, the road should be kept under maintenance for several days by blading and dragging until compacted firm and smooth. The conditions will govern the amount of maintenance and type of

equipment which should be used.

Make The Crown Right

Too much attention cannot be paid to working in the proper crown on the completed surface. This should be approximately ½-inch to the foot. A flat crown will permit pools of water to lay on the surface after rains and will soon result in a surface full of potholes. The water must be taken off the surface quickly if the road is to be kept smooth and intact. This matter of crown is one of the most important items in stabilized construction.

Conclusion

In conclusion it may be said that the stabilized road properly constructed fits very conveniently into the low-cost construction field and is very well adapted to the use of native local materials where they are available. Proper construction and a knowledge of maintenance is essential to secure satisfactory results. The application of theory and laboratory control must be done in a practical manner so as to secure good results without involving unreasonable costs to obtain unnecessary refinement.

From an A.R.B.A. convention paper.

Small-Size Rooters for 35, 50-Hp Tractors

The Type S rooter, designed for use with 35 and 50-hp tractors, has recently been announced by R. G. Le Tourneau, Inc., Stockton, Calif. In general, it follows the same design of the larger Le Tourneau rooters, with rugged, all-welded special steel construction, but is lightened somewhat to assure efficient use with tractors of from 35 to 50 hp.

Its length overall is 13½ feet, its overall width, 75 inches, with 24-inch diameter wheels and it is equipped with high-duty Timken bearings. The three-tooth model weighs 4,280 pounds and the five-tooth model, 4,760 pounds.

Maintenance Book Free

A 52-page booklet entitled "Road Maintenance with Tarvia" has recently been issued by the Barrett Co., 40 Rector St., New York City. This booklet covers the various phases of maintenance, including patching, filling cracks and joints, surface treatment, traffic-bound roads, curing slippery pavements, resurfacing, widening and reducing ex-

cessive crown, as well as the various types of road construction. The book is profusely illustrated and also contains a table showing the grades and purposes of the various types of Tarvia

and Tarvia-Lithic.

Copies of the booklet are available free to readers of CONTRACTORS AND ENGINEERS MONTHLY by writing direct to the company or to this magazine.



RAPID HEATING ACCURATE APPLICATION NO DRIPPING FROM NOZZLES

All of these—plus economical operation—are yours when you buy a Littleford Model "C" Pressure Distributor. Find out what this Distributor will do for you. Write for complete information covering whatever size you desire.

LITTLEFORD

Road Maintenance Equipment
SINCE 1900

LITTLEFORD BROS. 485 E. PEARL ST. CINCINNATI, O.



JACKSON VIBRO-SPADES make possible the successful and economical use of the new Metal Air Joints in concrete highway construction. Complete puddling of the concrete adjacent to the joint, with 100% bond between steel and slab is insured . . . and spading costs are reduced because ONE MAN with ONE VIBRO-SPADE easily spades the transverse and longitudinal joints and side forms. For jobs of all types and sizes, contractors prefer JACKSON VIBRO-SPADES.

Jackson Vibro-Spades are furnished in four models or sizes . . . VS-EI, VS-2, VS-3 and VS-4 . . . for various classes of work. Jackson Portable Power Plants, for use where power is not available on the job, are also furnished in various sizes ranging from light to heavy duty.

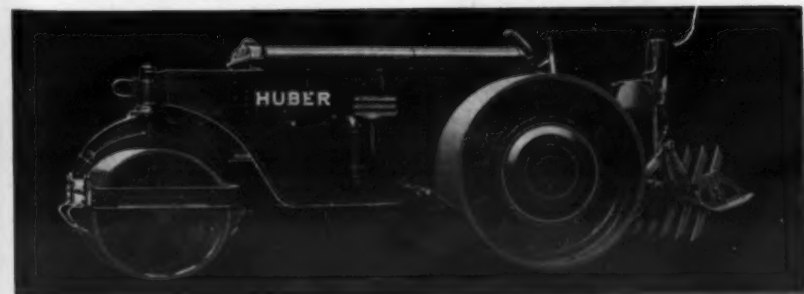
4 SIZES

JACKSON VIBRO-SPADES

are more dependable . . . easier to handle . . . do more jobs and do them better . . . are more economical to operate and maintain . . . sturdier . . . and place stronger, denser concrete with better bond between layers and between concrete and reinforcing, with greater uniformity, with greater water-tightness, and with definite savings in cement and labor.

Designed, engineered and built by the originators of vibratory concrete placing equipment, JACKSON VIBRO-SPADES lead the field in this important type of construction equipment. Constantly improved and developed, they simplify and perfect vibratory concrete placement on work of all types. Furnished in four sizes . . . with portable power plants if desired. Write for complete information. ELECTRIC TAMPER & EQUIPMENT CO., LUDINGTON, MICHIGAN.

HUBER ANNOUNCES . . . THE GREATEST 5-TON ROLLER EVER BUILT!



Huber again sets the pace with a brand new 5-TON hydraulic road roller. It's by far the greatest value ever offered. Features include a guaranteed positive trouble-free reverse with single lever control; a six-cylinder, heavy-duty engine; roller bearings throughout; full hydraulic control; dual steering (hand or power—instantaneous change-over); removable drive roll rims; short turns; four speeds both ways; high transport speed. These are but a few of the outstanding qualifications that make the Huber the greatest 5-Ton Road Roller ever built. Send for complete specifications.

THE HUBER MANUFACTURING CO., MARION, OHIO

Paving 6.97 Miles With Sand Asphalt

(Continued from page 5)

end. A Mack engine was used to rotate the drier and a Le Roi engine to drive a small compressor which supplied air for moving the asphalt and air pressure for the drier torches. The dried material discharged into an open chute for free inspection where a sample of sand mixture could be obtained before it was delivered to the boot of the hot elevator. The bucket elevator delivered the dry sand to a rotary screen which, on this contract, discarded all material over 10-mesh in size. Beneath the hot sand storage bin was a weighing batcher for the sand made by R. D. Cole of Newman, Ga.

A vertical steam boiler mounted in front of the plant supplied steam for the burners of the drier, for running the steam asphalt pump, and for heating the storage tank, the steam jacket of the mixing drum and the hollow blades of the mixer. It also furnished steam for the water pump.

Shell 50 to 60 penetration asphalt was received by tank car at Orchard, Ala., about 4½ miles from the plant. A steam booster plant at the spur track where the tank car was spotted maintained the temperature of the asphalt. Hauling to the mixing plant was done with a 600-gallon tank well insulated and mounted on a Mack 3½-ton truck. The truck delivered the hot asphalt to a 9,000-gallon storage tank at the plant, the material being forced from the tank truck to the storage tank by air pressure.

A Worthington reciprocating water pump was used to move the asphalt from the storage tank to the superheater, a coal-fired kettle where the temperature was raised to 275-350 degrees Fahrenheit. From the superheater the asphalt flowed by gravity to the weighing cylinder or closed tank mounted on beam scales. From the weigh tank it was raised to the rotary mixer drum by air pressure. The mixer was operated by a Le Roi gasoline engine.

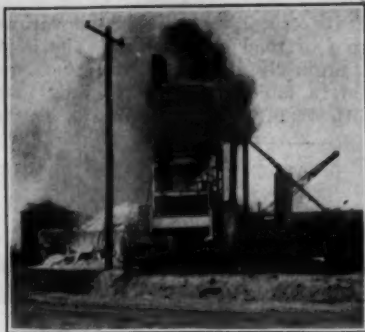
Batch Handling

The batches for the base and top varied somewhat in composition as follows: Base, 9,280 pounds of sand, 720 pounds of asphalt; Top, 8,420 pounds of sand, 960 pounds of asphalt and 620 pounds of limestone dust. The batches were all mixed 5 minutes and one batch constituted a truck load.

The batches were hauled to the grade by a fleet of six trucks with sheet iron bodies made for A. G. Boone of Columbia, S. C., hauling 10,000-pound batches to the load without any difficulty. The truck bodies were oiled about every third load to prevent sticking.

Labor Organization

When running base, a crew of fourteen men was required to operate the



C. & E. M. Photo

The Rotary Mixing Plant Which Averaged 300 Tons of Hot Mix a Day.

plant but two more were added when running top to handle the limestone dust. The plant and road crews each worked 12-hour shifts, or 10-hour shifts with the extra 2 hours to make up for lost time due to bad weather, of which there was plenty on this contract. Paving was started April 19 and between that date and August 10 they were able

(Continued on page 35)

Line of Core Drills for Highway Testing

Class PT Calyx core drills, particularly adaptable for drilling sample cores from concrete highways, are part of a complete line of Calyx drills made by the Ingersoll-Rand Co., 11 Broadway, New York City. In this capacity the machine produces a sample which shows the exact condition of the road, and its base and subsoil.

In most cases these drills are mounted on motor trucks but special self-propelled mounted units are available. These, operated in pairs or as units of a fleet, permit very rapid and efficient sampling of long stretches of highway at frequent intervals. Gasoline power is standard on these drills, but an electric-motor-driven drill is available for town pavement testing or for stationary laboratory experimental work.

Machines of this type already in service have also been used for drilling

holes for electric light standards, holes through concrete slabs for filling underlying seams, 18 to 24-inch holes for manholes through pavement or side walks, holes for safety zone standards and similar purposes.

A complete description of these units as well as the other members of the line of Calyx drills will be found in a new 48-page catalog No. 9501 which may be secured free direct from the company.



2" Self-Priming Centrifugal Pump

Easily carried by one man; 100% automatic. No handles or petcocks to be adjusted.

Four-cycle engine with oil reservoir in crankcase.

Easy to start—Speed control—Air cleaner. Foot and rope starters—self-oiling. Engine has only one place requiring lubrication.

Ask for Specification Sheet 20A.

Marlow Pumps, Ridgewood, N.J.

KOEHRING

11
KOEHRING
CRANES
on

this job



BUILDING THE APPROACHES AND SUBWAYS FOR PHILADELPHIA-CAMDEN HIGH-SPEED LINE

Contractors, engaged in the construction of the subways and approaches for the High-Speed line of the Philadelphia-Camden Bridge — chose Koehring Equipment, to reduce costs and increase production.



THE NATIONAL CARBIDE V-G LIGHT

Gives you daylight conditions on night jobs. Spreads a full, even beam of 8000 candlepower right where you need it.

Lights up the job for twelve hours on one 7-pound charge of National 14-ND Carbide and 7 gallons of water. Is easily handled by one man; has nothing to get out of order; no harm done if it tips over—just stand it up again, and it goes right on working. Weight 35 lbs. empty; 98 lbs. when full.

Write for catalogs on V-G Light, V-G Handy Light and Lanterns.

NATIONAL CARBIDE SALES CORP. LINCOLN BLDG. NEW YORK (Opp. Grand Central)

KOEHRING COMPANY
Pavers - Mixers - Shovels - Cranes - Draglines - Dumpsters - Mud-Jacks
3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN

Records on Your Tires Pay Big Dividends

Most contractors will say off-hand that they know their cost per mile on tires and other truck equipment. But often they do not know definitely enough to recognize the difference between rock-bottom costs and expense that eats into the business. If the operator has records he will know these costs, and he will know how to prevent road delays. If he does not have the records, he is guessing; and his guesses are too vague to be of real use.

"I don't have time to keep tire records," the operator of a truck often claims. But keeping such records can be a simple matter, and it is necessary if the operation of the fleet is to be on a business-like basis. Tire records are most important, operators find, because "something can always be done about costs."

The truck driver's part in record keeping should be very simple. He should have a report card to turn in with the truck, checking the listed items of supplies needed or the parts requiring attention. For tires, a tag which he puts on the tire as it comes off the wheel and which is then passed on for the office to tabulate, is sufficient.

Firestone Tire & Rubber Co., Akron, Ohio, has developed a simple and efficient truck mileage and cost record system. It consists of a Tire Change Tag, on which can be recorded the serial number of the tire, the date and place of change, vehicle number, speedometer reading, position of tire when it came off and when it went on, cause of removal, who made the change, and the final disposition.

In the office, these tags are used to make up the monthly Vehicle Record, which shows the daily speedometer reading of the vehicle and the serial number of each of its tires. This Vehicle Record is used to make the Tire Mileage Record for each tire during its life, and shows its mileage on any truck and in any position it has served.

From this record, a glance will show rapid tread wear and wheel position on which it occurred; mileage you get from various makes of tires; and accurate tires costs. Premature tire wear may be traced and its causes determined. If a tire is worn out at 12,000 miles or faster than the average, and has been on a front wheel, misalignment or mechanical irregularity is indicated and can be corrected.

The record shows how good your maintenance is and how it can be improved. It is the job of your garage personnel to get more tire mileage by maintaining proper pressure, by putting smooth tires on the inside when duals are used, by putting new tires on front, and by rotating tires. These records show how well this is done.

They also show what tires are the best to buy, for cost per mile, not purchase price, is the business basis of cost. Other truck records similar to those for

tires should also be kept and the set of records will help to prevent unnecessary expense, delay and accidents, adding an important margin of profit for the contractor and cutting down the overhead for highway departments.

Sets of blanks for these tire records are available gratis to readers of **CONTRACTORS AND ENGINEERS MONTHLY** by writing direct to Firestone or to this magazine.

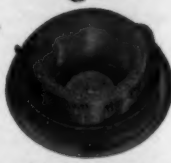
New Detroit Distributor Appointed by Link-Belt

R. G. Moeller Co., 14415 Meyers Road, Detroit, Mich., has recently been appointed distributor of Link-Belt crawler shovels, cranes, draglines, and locomotive track-type cranes by the Link-Belt Co., Chicago, Ill. The Moeller organization was established in 1924 and has twice moved to larger quarters to take care of increased business. R. G. Moeller is President; O. H. Baker, Secretary; C. C. Huebner, Vice President; and T. C. Moeller, Sales Manager.



Oil Bath Type

Regularly used by
Ingersoll-Rand
Worthington
Gardner-Denver
Schramm
Davy
Okoh Clutch
& Mch.
Quincy
and over 100
manufacturers



AIR-MAZE

AIR FILTERS FOR EVERY INDUSTRIAL PURPOSE

Look Inside

the air cleaners you are now using on trucks, air compressors and power driven road machinery. For once you see the inside of your present filters, you will know why we say look inside of a filter. Air-Maze is different from other filters in that it has an exact, uniform, density and does not clog up or cause any retarding restrictions. * A clogged air filter is a costly thing—it cuts down gasoline mileage as much as 20%. But Air-Maze doesn't work that way, and you can have an Air-Maze by simply specifying it whenever you order air compressors or engine powered equipment. Let us tell how Air-Maze will re-value your Air Filter experience.

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"You've got to watch costs on haulage jobs



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CHEVROLET Chevrolet trucks are precision-engineered to deliver outstanding results on the cost ledger as well as on the job. The improved Blue-Flame six-cylinder truck engine is a masterpiece of power efficiency—giving full power at hauling speeds, along with unusual operating economy. Extra-strong axles,

husky transmissions, rugged springs... each and every sturdy part... assure more payload hours and smaller maintenance costs. Your Chevrolet dealer invites you to get the "Owner's Simplified Operating Record" and learn of Chevrolet's low operating costs.

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Gentlemen: Without obligation on my part, send me the "Owner's Simplified Operating Record" booklet which enables truck owners to learn operating costs quickly and accurately.

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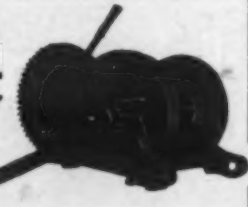
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Capacity—5 tons straight line
Weight—110 pounds
Size—16x17x13" high
Two speeds—4 to 1; 24 to 1
Positive internal brake

Price \$75. Write for list of dealers

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Analysis of 1334 Injuries on Highway Construction

This is the season when highway construction is at its peak. It might be well, therefore, to give some thought to making this highway construction season a safe one, free from all avoidable accidents.

Thomas Soule of the Industrial Indemnity Exchange made the following analysis of 1,334 injuries on highway construction, which offers some food for thought:

Explosives	6.1 per cent
Falls of persons from elevations	.1 "
Stepping on nails	.1 "
Stationary machinery and equipment	.1 "
Fall of rock	3.0 "
Struck by falling objects	4.0 "
Caught between objects	4.0 "
Burns	4.0 "
Poison oak and cement dermatitis	5.0 "
Injuries resulting from infection	6.0 "
Hand tools	6.0 "
Falling or striking against objects	6.0 "
Slipping, stumbling, tripping	8.0 "
Struck by rolling or flying objects	9.0 "
Lifting and handling objects	9.0 "
Foreign bodies in eye	13.0 "
Repair and operation of trucks and other power-driven equipment	18.0 "

The percentages refer only to the number of accidents reported. An analysis prepared by E. N. Goldstine, General Chairman of the Executive Committee of the Construction Section of the National Safety Council gave comparable accident frequency figures. The percentage of days lost time for rock slides was 35 per cent; for truck accidents, 44 per cent; but only 58 accidents were covered, of which 21 were disabling.

Ten severe injuries in this latter group resulted in four times as many days lost from work as eleven other disabling injuries. This would seem that some hazards should receive at least four times as much attention as others.

—From the News Letter of the Construction Section of the National Safety Council.

Changes in Territories of A. I. S. C.

Changes in the territories served by the District Engineers of the American Institute of Steel Construction have recently been announced by F. H. Frankland, Technical Director of the Institute. The following is the list of engineers and the territories they will serve. Mr. Frankland himself represents the Institute in New York City and Washington, D. C.

District No. 1—E. N. Adams, 2 Homer St., Worcester, Mass.—Connecticut, Maine, Massachusetts, New Hampshire, New York (except southern portion), Rhode Island, Vermont.

District No. 2—B. F. Hastings, 15 East Wilmot Ave., Llanerch, Upper Darby, Pa.—Alabama, Delaware, Florida, Georgia, Maryland, New Jersey, southeastern New York, North Carolina, Pennsylvania, South Carolina, Virginia.

District No. 3—Alexander Miller, 2124 Guarantee Title Bldg., Cleveland, Ohio.—Indiana (except northern portion), Kentucky, eastern Louisiana, Michigan, Mississippi, Ohio, northwestern Pennsylvania, Tennessee, West Virginia.

District No. 4—Henry Penn, Room 1443, 53 W. Jackson Blvd., Chicago, Ill.—Illinois, northern Indiana, Iowa, Minnesota, Montana, North Dakota, South Dakota, Wisconsin.

District No. 5—Jack Singleton, 640 New England Bldg., Topeka, Kans.—Arkansas, Colorado, Kansas, western Louisiana, Nebraska, Missouri, New Mexico, Oklahoma, Texas, Wyoming.

District No. 6—W. E. Emmett, 901 Russ Bldg., San Francisco, Calif.—Arizona, California, Idaho, Nevada, Oregon, Utah, Washington.

Write for Bulletin 200, just off press



HELTZEL STEEL FORMS

● Illustration shows Heltzel Rigid Radius Forms. Heltzel also manufactures a complete line of Steel Forms for building roads, sidewalks, curb-and-gutter, manholes, pipes, walls, sewers, tunnels—and special construction projects.

THE HELTZEL STEEL FORM & IRON COMPANY
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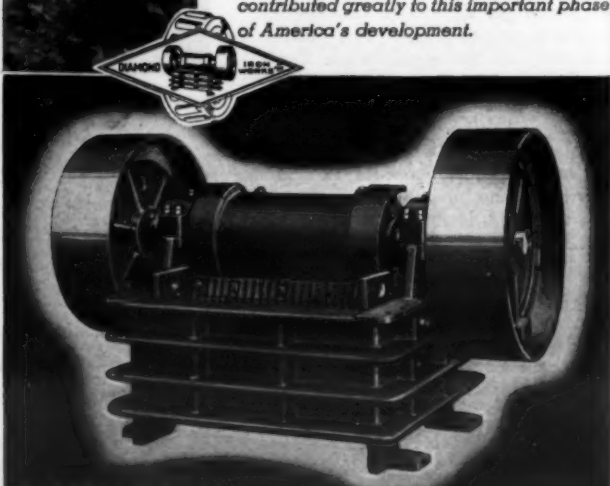
Is it really GOLD ?



No. 65 Portable Crushing and Screening Plant Operating in Michigan

In addition to roller bearing jaw and roll crushers, the 1935 DIAMOND Crushing and Screening Plant has anti-friction bearings throughout, all babbit bearings having been eliminated. This is a further step in producing a crushing and screening plant to operate at the absolute minimum cost.

Write for illustrated folder describing the many superior features of DIAMOND Crushing and Screening Plants.



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"ON THE JOB"

BACK in 1905, we built the American Ditcher Shovel, the first shovel type machine made. Today, American Gopher Shovels are a complete line of successful shovels, built in sizes $\frac{1}{2}$ yd., $\frac{3}{4}$ yd., 1 yd., $1\frac{1}{2}$ yd., $1\frac{3}{4}$ yd. and 2 yd. dragline.

Send for new photo publication, "American Gopher Shovels" illustrated, showing action pictures "on the job".



AMERICAN HOIST & DERRICK COMPANY
ST. PAUL, MINNESOTA



Back in 1849 there was but one known piece of gold on one section of the frontier. It was a gold headed cane. It belonged to an early settler who had brought it the hundreds of weary miles separating him from New York. Upon the resemblance of of new found metal to this cane head, claims were staked, fortunes made or lost.

The great expanse of roadless America made it impossible for even those sturdy pioneers to return with their precious finds to determine whether they were digging precious gold or worthless "fools' gold."

Today great highways bring these far flung frontiers within quick and easy access.

Diamond road building equipment has contributed greatly to this important phase of America's development.

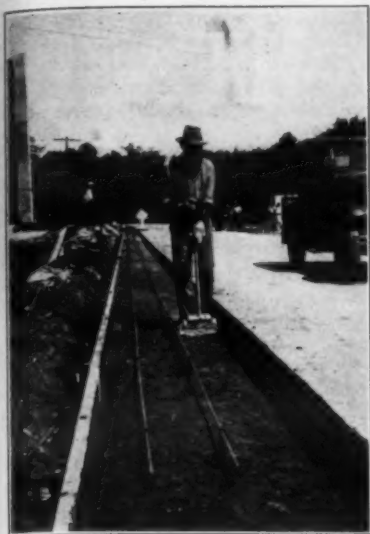
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C. & E. M. Photo

A 3-Foot Widening Strip Ready for Pouring

Texas Road Widened with Truck Mixers

(Continued from page 8)

chute had been placed on its pivot at the back of the truck. One man of the concreting crew regulated the flow from the drum, two were required to push it down the chute because of its relative dryness, two men spread or puddled the concrete, and one finisher was ready to start work as soon as the material had progressed far enough ahead. As soon as pouring from one truck mixer stopped, and one load poured about 22 feet of strip, two of the concrete crew went back on the longitudinal float, the puddlers began spading against the forms and the old slab, and the finisher started his important function. After the concrete had been straight-edged under the direction of the State Inspector the finisher was permitted to edge it against the forms.

Curing and Pulling Forms

One man was responsible for the entire curing operation. He wet down piles of burlap rice bags and then placed them on the strip as soon as the edging had been completed. The rice bags were about the proper size to handle readily, were particularly cheap at the time, and were of double thickness so that they held the water more than twice as long as the regulation weight single thickness of burlap, so that it was possible to use the same man for placing and sprinkling the burlap. It was kept wet day and night, there being a different operator for the night shift. The burlap was left on the concrete for a minimum of 72 hours.

The forms were regularly stripped the morning following pouring. A crew of eight men handled this work with definite duties assigned to each, permitting the rapid handling of the 2,000 feet of forms that had to be kept ahead of the pouring because of the length of strip that could be poured each day. The crew split up into sections with two men unlatching the forms, pulling the pins and dropping

them on the pavement; then two other men set up the forms on the pavement, leaving the edge of the strip exposed for inspection. Two other men started at once loading the forms on the Chevrolet utility truck for hauling ahead, while the remaining members of the crew began backfilling against the edge of the strip. As soon as each other pair completed their work they too assisted in the backfilling.

Shoulders

The shoulders were formed from the material excavated from the old shoulders to permit pouring the widening strip. As sufficient material could not be secured in this manner for the 5-foot shoulders graded to a 2 to 1 slope, a large amount of overhaul was necessary from the eastern end of the project where banks on either side of the old pavement produced an excess of excavated material.

The contractor worked two complete crews, dividing the week with one outfit working 10 hours a day for Monday, Tuesday and Wednesday and the second crew completing the week.

Personnel

This contract which was started on July 9, 1934 was completed by August 15. For the contractor, Broussard-Warfield Co., Beaumont, Texas, M. E. Mills, Jr., was Engineer and Superintendent, W. E. Suter was Resident Engineer for the Texas State Highway Department and Edward C. Jancik was Inspector.

Highway Lighting Systems In Europe Reduce Glare

Europe has set an example in raising the center of its highway lights to 25 feet. Ease of accessibility seems willingly sacrificed for improved uniformity of illumination and greatly reduced glare, according to Samuel G. Hibben, Director of Applied Lighting, Westinghouse Lamp Co.

One of the latest European inter-city highways employs light sources at a height of 30 feet, center suspension, on catenary cable supported above the center-line of the roadway. Other typical cases of the new installations, and exemplifying the radical improvements, is the placement along highways of light sources that tend toward average sizes at relatively closer spacings, instead of uncomfortably brilliant sources at such

wide spacings that the ratio of height to distance would be on the order of 1 to 10. As a matter of fact, ratios of 1 to 2 are being studied, and 1 to 5 are not at all uncommon.

One of the newer suburban installations of high-intensity mercury vapor lamps in a large European capital employs 275-watt sources spaced 225 feet apart but staggered on both sides of a 50-foot roadway. Other studies are be-

ing made of a 300-foot spacing of concrete poles, these extending 42 feet above ground, and with such uniform distribution of light on the roadway that night driving speeds may equal or exceed those of the daytime and with apparently as good visibility.

Readers may secure copies of a four-page reprint on European Highway Lighting by writing direct to the Westinghouse Lamp Co., Bloomfield, N.J.



A Complete Range of Sizes—2" to 8"—Sized and powered for every pumping job

**THE MOST FOOT GALLONS PER HOUR
— PER DOLLAR OF COST —
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1000-Gallon
Kinney Distributor
Mounted on Ford-Warford Truck

*2. Kinney Distributors load, get to the job, and apply faster!

This means more work with the same labor cost; more contracts per season; lower demurrage charges; and the lower operating costs allow you to quote prices which get those contracts.

- The Kinney jacketed pump easily handles sluggish materials within approximately 30° F. of their melting point or at temperatures up to 450° F., providing a pumping unit suitable for loading bitumen or applying it under pressure.
- Kinneys get to the job faster from the source of supply because their larger pump capacity makes it unnecessary to gear down the truck to meet application requirements. Thus a Kinney, with its 400 G.P.M. pump, can operate 400/300ths or one and a third times as fast as a distributor with a 300 gallon pump! The difference means 40-mile-an-hour trucks instead of 30—more pay loads per day—and that means more profit!
- Kinneys will apply 2.5 gallons per square yard to a 20-ft. wide road at one application at a speed of 0.8 miles per hour—or any quantity from 0.1 to 3.0 gallons per square yard at proportionate road speeds.

*One of 7 reasons why Kinneys help you make more profit. Others are given in Bulletin A-1935, address

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Surface Types on PWA Projects

The character of improvements on Federal Public Works projects covers the entire range of surface types. The wide variety of types of roadways built with Federal Aid and their proper relation to traffic requirements is particularly noticeable in the classification of surface types included in the public works program.

The improvements planned on 25,479 miles of highways and streets in projects approved to September 1934 are classified by types as follows:

Type	Miles	Per Cent
Graded, preliminary to surfacing	8,809	22.0
Low type, sand clay, gravel, macadam, low-cost bit. mixes	14,022	55.1
High type, bituminous macadam, portland cement concrete, brick	5,867	22.9
Total	25,479	100.0

The variation of these percentages in these three groups of types shows the reasonableness of the adjustment of the improvements to traffic needs.

In the case of projects for improvements on extensions of the Federal-Aid highway system into and through municipalities 68.5 per cent of the mileage has been planned to have high-type surfacing, 24.2 per cent low-type surfacing and 7.3 per cent is being graded for later surfacing. In contrast the improvements on secondary or feeder roads call for only 11.6 per cent of high-type pavements, 64.2 per cent of low-type surfaces and 24.2 per cent of grading preliminary to surfacing.

The improvements on rural sections of the Federal-Aid system outside the corporate limits of municipalities are largely of lower type than the municipal projects and of higher type than the secondary road projects. In this classification high-type pavements are 52.7 per cent of the total, low-type surfaces 24.7 per cent and the grading projects, 22.6 per cent.

From a paper by C. N. Connor, Senior Highway Design Engineer, U. S. B. P. R., presented before the American Road Builders' Association.

Improved Bucket Elevators Described in New Catalog

Catalog No. 565 of 112 pages, covering a broad field of elevator requirements, has recently been issued by Jeffrey Manufacturing Co., Columbus, Ohio. The first chapter of the book is devoted to the fundamentals of design, application and operation and contains many helpful suggestions for selecting

the type of elevator best suited to the requirements of the job.

The catalog also includes information on the increased number of vertical-space type centrifugal discharge elevators with the buckets mounted on chain or belt, and a line of heavy-duty continuous bucket elevators in casings.

These elevators are equipped with new short heavy rigid pillow blocks for shafting bearings, and are furnished with cut gears in place of large cast tooth gears. Head sections are designed more rigid and compact, with bearing supports where they do the most good. Redesigns include a new Universal boot

applicable to any type of Jeffrey elevator, which gives flexibility in the vertical location of the feed spout. With it, the pit depth may be kept to a minimum when handling free-flowing materials.

Copies of this new catalog are available gratis to readers of this magazine.

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- ★ 8 rear wheels mounted on dual pneumatic tires, with 4 rocking axles
- ★ 2 rocking axles front, mounted on pneumatic tires

- ★ Swinging side brackets to widen the trailer, when necessary

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Dredge Pumped Fill to Widen Highway

(Continued from page 2)

wide and were built in two 10-foot sections so that traffic could be put over one-half the road and work done on the section of pipe on the other side. These two sections were built of 7 x 10-inch stock cut down wedge-shaped to 1 x 10 for the first timber and similarly for the remainder to form a ramp of low grade. The next section on either side had four stringers for one-half of the roadway, also cut wedge-shaped and were 8 feet 6 inches long. These carried 3 x 10 planking laid crosswise with 2 inches space between to make the section lighter and to give the men a place to get a hold on the section for moving. This section was carried on a 3 x 14-inch timber at the center so that the whole could be bolted together to give greater solidarity. The next two sections, one on either side, were 3 x 14's 4 feet long with the top planks running longitudinally and with 2 x 4's under the uprights at the center edge to take care of the pipe diameter. The center section was also 4 feet long and built the same as the adjacent sections except that it was horizontal and not on a slope.

The bridge and pipe line were moved about once in six days. The land crew consisted of about seven men per shift and there were five men on the dredge boat and dredge tender.

The Pontoon Section of the Line

The pontoon sections, measuring 70 feet long, were carried on four steel cylinders or floats and were connected by a new sleeve which eliminated many of the troubles of the old sleeve which bulged out and caused undue friction and wear in the rubber sleeve. About 8 inches back from the end of each of the pontoon pipes a ring, half oval in cross section, 1½-inch x ½ inch wide, was welded and then the rubber sleeve, made by the U. S. Rubber Co., was slipped over the rings and the whole held firmly in place by two bands or clamps on the end of each pipe, one on either side of the ring. The sleeve was built up in steps with the inner section corresponding to the diameter of the pipe itself. The first step was equal to the thickness of the pipe and the second to the height of the welded ring. Close to the outside of the sleeve a precoiled steel spring was imbedded to prevent the flexible sleeve from bulging. The bulge on the old sleeves caused a great deal of turbulence and loss of head with the consequent wear on both the sleeve and the end of the pipe. The



C. & E. M. Photo

New Rubber Sleeve for Pontoon Line

pontoons were 36 inches in diameter and varied from 14 to 20 feet long.

The Dredge Manatee

The new dredge Manatee, built from designs of R. C. Pierce, Assoc. Mem., Am. Soc. C. E., and Vice President and Treasurer of the company, has an overall length of 120 feet, is 7 feet 7 inches in depth and has a beam of 34 feet. The design and operation of the Manatee will be described in detail in

the June issue of this magazine.

Shifts and Labor Organization

The work of dredging was carried on 24 hours a day for 6 days a week, using Sundays for adjustments and repairs. The shifts worked from 7 A.M. to 3 P.M., from 3 P.M. to 11 P.M. and from 11 P.M. to 7 A.M. The week was split in the middle to comply with the 30-hour a week requirement for NRH work. The engineers and operators were exempt and were permitted to work 40 hours a week. One extra operator was carried who was also an engineer and he took up the split shifts.

The operating crew for the dredge was as follows for each shift: one operator, one tug boat captain, one deck mate who moved the anchors and cared for the pontoon line, two deck hands, one shift engineer and one oiler.

Personnel

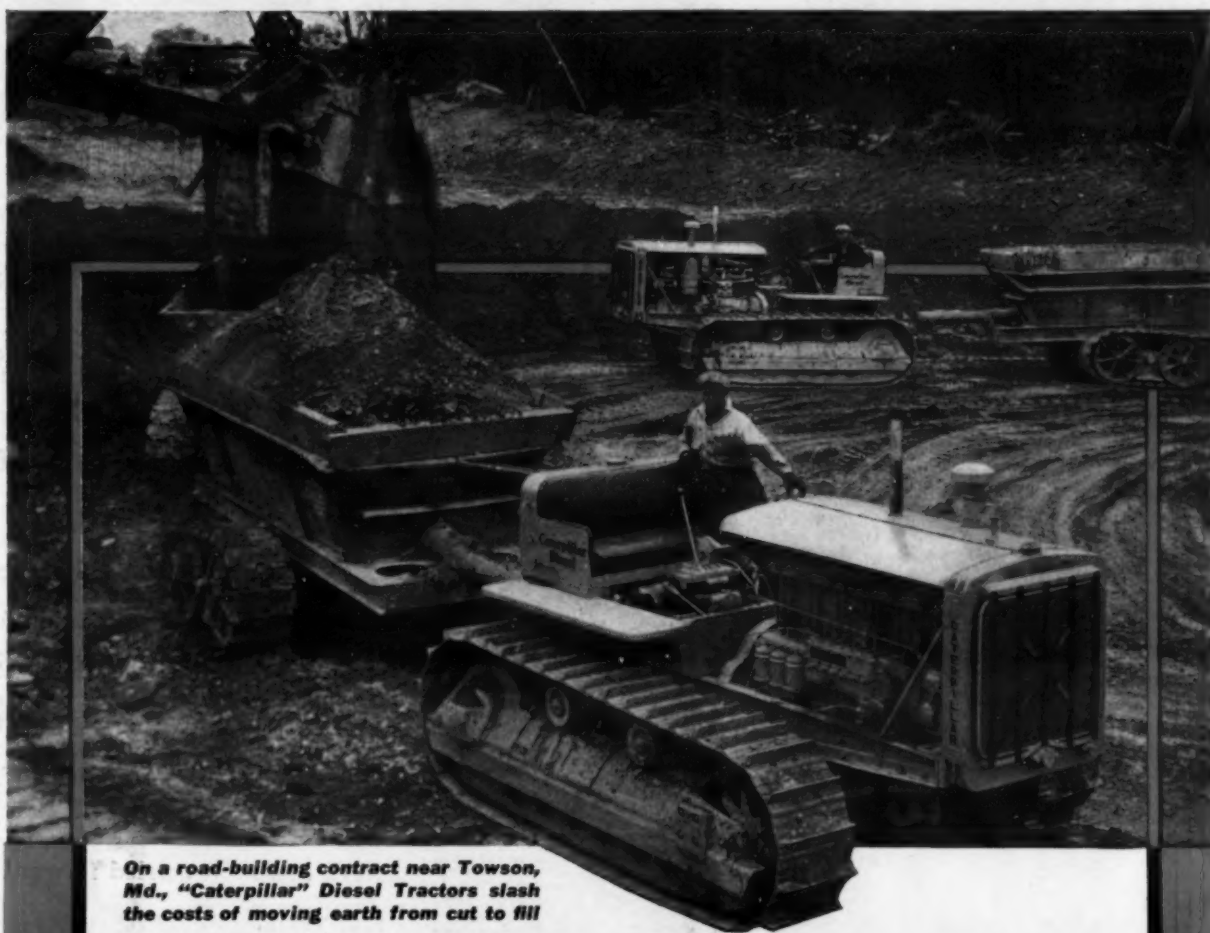
This contract for 2,200,000 cubic yards of material in place in the highway fill was awarded to Wilbanks & Pierce, Inc., of New Orleans, La., for

14.40 cents per cubic yard. The owners, J. R. Wilbanks and R. C. Pierce, were frequently on the work which was in general charge of H. W. Nugent as General Manager for Wilbanks & Pierce, Inc., and in direct charge of R. R. Runck as Superintendent, with Capt. D. E. Chalker in command of the dredge Manatee. For the Louisiana Highway Commission, W. C. Youngs was Resident Engineer.



C. & E. M. Photo

R. R. Runck, Supt., and Captain D. E. Chalker.



On a road-building contract near Towson, Md., "Caterpillar" Diesel Tractors slash the costs of moving earth from cut to fill

THE SHOW-DOWN IS MAKING HISTORY

New records for economy and dependability, a new basis for the estimating of power costs—the performance of thousands of "Caterpillar" Diesel Tractors on hundreds of operations is making engineers and contractors sit up and take notice. Your dealer can show you complete, comparative figures on "Caterpillar" Diesels now at work, and let you put one to the test yourself. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

REG. U. S. PAT. OFF.

D I E S E L

SAVE CRANE TIME!

FINISH JOBS FASTER!

Make MORE Profit!

For a real conception of how digging you should use the Williams "Champion" Power-Arm Bucket in action! Exclusive combination of lever and hook-and-latch assures super-power . . . And shorter cable overhaul cuts time between bucketfuls.



We also build Williams Multiple-Rope Buckets and Dragline Buckets. May we send you bulletins?

THE WELLMAN ENGINEERING CO.
7012 Central Ave., Cleveland, Ohio

**WILLIAMS
BUCKETS**

Fighting the Dust Hazard

Gravel, cinder, slag and stone roads are dusty in dry weather unless treated with a dust palliative. Dust is not alone dangerous to traffic trying to drive through it, but it is also a nuisance and a detriment to the health of the people living along the roads.

The laying of dust is accomplished by either the application of calcium chloride to the surface or treatment of the surface with a bituminous material.

The former method is much cheaper but gives only temporary results. Because of the cost there have been no attempts made to lay the dust on all roads. Some very satisfactory results have been secured in Wayne County, (Detroit) Mich. by the application of several chloride treatments during the summer in front of dwellings through residential sections.

Approximately 7 miles of the more important gravel roads were given a bituminous treatment this past season in Detroit with very satisfactory results.

This treatment consisted of a 3-inch surface of a mixture of gravel and asphaltic oil. It was mixed and laid out on the road with graders, providing a smooth, dustless surface for traffic.

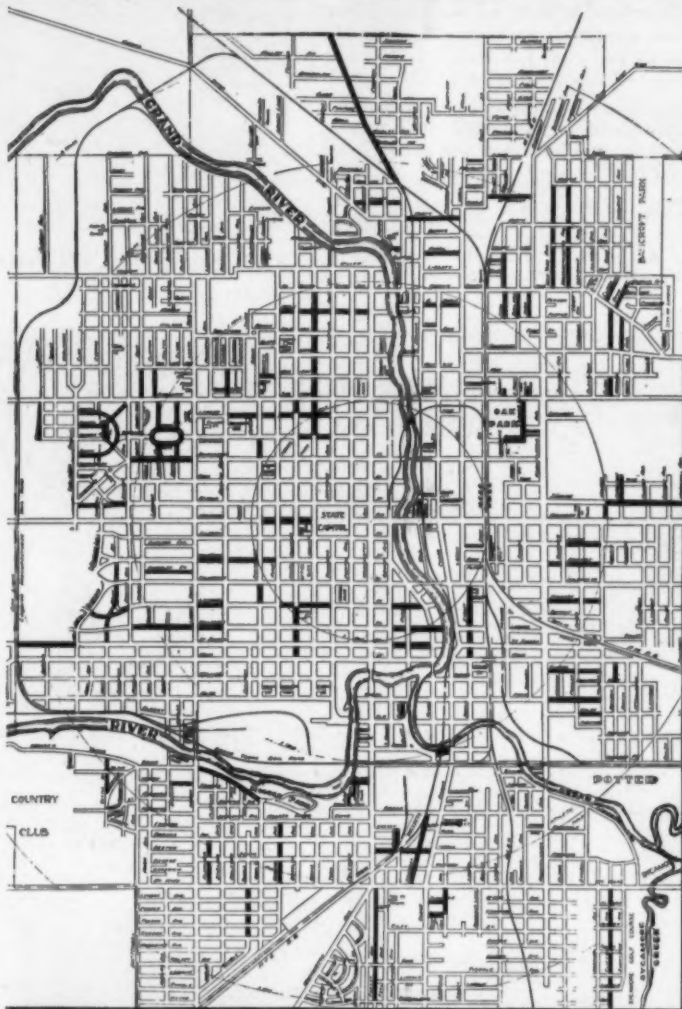
From the Twenty-Eighth Annual Report, Board of County Road Commissioners, Wayne County (Detroit), Mich.

Promotions at du Pont

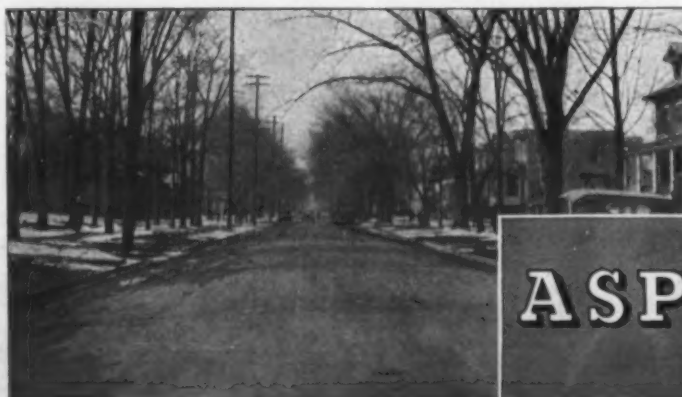
John W. McCoy, General Manager of the Explosives Department of the du Pont Company, has been elected a member of the company's Board of Directors,

and has also been made a Vice President and member of the Executive Committee. Mr. McCoy has been connected with the company since 1902. Since that time he has served continuously in a number of the company's plants in various parts of the country, in addition to a tour of duty in Mexico.

Edward B. Yancey, who joined the du Pont organization twenty-seven years ago, succeeds McCoy as General Manager of the Explosives Department. He has been Assistant General Manager since 1929.



Samuel C. Jacks, City Engineer of Lansing, is supervising the program that is making his city one of the best paved in the State of Michigan. A view of the State Capitol is shown above.



Look at LANSING!

Well Paved... Economically



LANSING, MICHIGAN, has been, and still is, building a reputation for well-paved streets. Selection of Plant Mixed Liquid Asphalt and Gravel as the material used on a major portion of this work speaks highly for the diligent economy of Lansing officials. This work has been carried forward for the past four years.

Blacked-in streets on the map above show the places in which Standard Asphalt Road Oil has been used since 1930—275,000 yards.

Stanolind Asphalt Products provide correct materials for every type of traffic demand. You'll find it pays to call in the Standard Oil representative on every paving job.

STANDARD OIL COMPANY (Indiana)
910 South Michigan Avenue, Chicago, Ill.

Copy, 1935, Standard Oil Co.



ASPHALT for every Purpose

ASPHALT FOR PAVING... ASPHALT

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Highway Program for 1935 Assured

(Continued from page 1)

to predetermine for each state the hours of work and the rates of wages to be paid skilled, intermediate and unskilled labor.

Whenever practicable, full advantage shall be taken of the facilities of private enterprise (contract system).

The Act also continues the penalty clause for states diverting motor vehicle and gasoline taxes.

Apportionment of Funds

The allotments to states given below are based upon the total appropriation of \$800,000,000 authorized by the Act, with \$500,000,000 for roads and \$300,000,000 for grade crossing elimination. For highways, roads and streets, the apportionment is based seven-eighths on Federal Aid and one-eighth on population. For grade crossing elimination, the apportionment is based one-half on population, one-quarter on miles of F-A highway system and one-quarter on miles of railroad.

BASIS OF APPORTIONMENT

STATE	Highway Roads Streets	Grade Crossing Elimination	TOTAL
Alabama	10,645,000	6,219,000	16,864,000
Arizona	6,590,000	1,950,000	8,540,000
Arkansas	8,595,000	5,493,000	14,088,000
California	19,865,000	11,382,000	31,247,000
Colorado	8,710,000	4,086,000	12,796,000
Connecticut	3,640,000	2,622,000	6,262,000
Delaware	2,310,000	663,000	2,973,000
Florida	6,660,000	4,350,000	11,010,000
Georgia	12,795,000	7,566,000	20,361,000
Idaho	5,700,000	2,610,000	8,310,000
Illinois	22,290,000	15,780,000	38,070,000
Indiana	12,670,000	7,872,000	20,542,000
Iowa	12,800,000	8,595,000	21,395,000
Kansas	12,805,000	7,932,000	20,737,000
Kentucky	9,555,000	5,682,000	15,237,000
Louisiana	7,410,000	4,950,000	12,360,000
Maine	4,300,000	2,202,000	6,502,000
Maryland	4,490,000	3,210,000	7,700,000
Massachusetts	8,365,000	6,330,000	14,695,000
Michigan	16,160,000	10,146,000	26,306,000
Minnesota	13,530,000	8,280,000	21,810,000
Mississippi	8,865,000	5,025,000	13,890,000
Missouri	15,415,000	9,492,000	24,907,000
Montana	9,425,000	4,284,000	13,709,000
Nebraska	9,925,000	5,556,000	15,481,000
Nevada	3,750,000	1,371,000	5,121,000
New Hampshire	7,795,000	1,923,000	9,718,000
New Jersey	8,020,000	6,114,000	14,134,000
New Mexico	7,365,000	2,742,000	10,107,000
New York	20,325,000	20,790,000	41,115,000
North Carolina	12,105,000	7,470,000	19,575,000
North Dakota	7,350,000	5,106,000	12,456,000
Ohio	19,670,000	12,840,000	32,510,000
Oklahoma	11,745,000	7,840,000	19,585,000
Oregon	7,795,000	5,633,000	13,428,000
Pennsylvania	23,965,000	17,703,000	41,668,000
Rhode Island	2,535,000	1,077,000	3,612,000
South Carolina	6,930,000	4,530,000	11,460,000
South Dakota	7,630,000	4,392,000	12,022,000
Tennessee	10,750,000	5,829,000	16,579,000
Texas	30,740,000	16,778,000	47,518,000
Utah	5,305,000	1,923,000	7,228,000
Vermont	2,370,000	1,128,000	3,498,000
Virginia	9,365,000	5,817,000	15,182,000
Washington	7,760,000	4,707,000	12,467,000
West Virginia	5,720,000	4,125,000	9,845,000
Wisconsin	12,370,000	7,734,000	20,104,000
Wyoming	5,690,000	2,178,000	7,868,000
Dist. of Col.	2,435,000	603,000	3,038,000
Hawaii	2,375,000	711,000	3,086,000
TOTAL	\$500,000,000	\$300,000,000	\$800,000,000

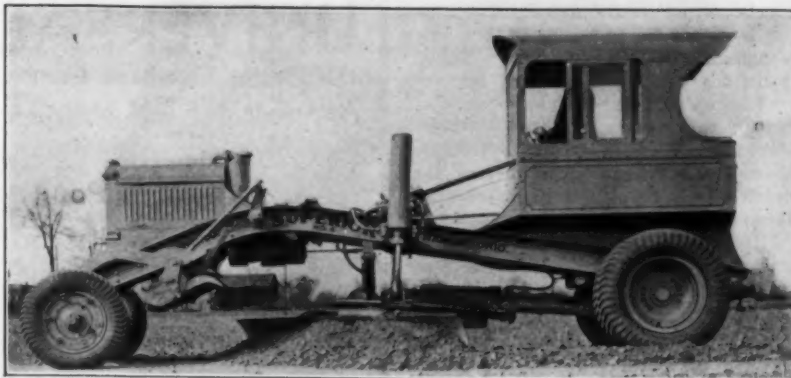
Maintenance Methods Differ for Stabilized Roads

"Maintenance of Calcium Chloride Stabilized Roads" is the title of a new bulletin recently issued by the Calcium Chloride Association and its member companies. Designed for the guidance of the practical engineer, this bulletin describes the procedure as differing from usual maintenance methods involved in obtaining the highest service value from stabilized surfaces, taking into consideration the special characteristics of this type of surface.

Copies of this Bulletin No. 18 may be secured gratis from the Calcium Chloride Association, Penobscot Bldg., Detroit, Mich.

Blanchard Joins Caterpillar Sales Force

Frank E. Blanchard, formerly Manager of Sales in the southeastern states for Climax Engineering Co., recently joined the Caterpillar Tractor Co., Peoria, Ill., as a member of the Special Sales Department. Blanchard has had wide experience in engine sales and engineering fields.



The New Huber Grader

New Motor Grader Has Several Features

Among the features of the new Huber motor grader, recently announced by the Huber Manufacturing Co., Marion, Ohio, is the mounting of the engine. Instead of the conventional design with

tractor mounted in the rear, the new Huber Superior No. 4 has the engine mounted toward the front of the frame, the power being transmitted to the rear axle assembly through a shaft, similar to the method employed in heavy truck construction. Instead of drawing the blade by drawbars attached to the front of the frame, the blade is pushed, bull-

dozer style, by a heavy tube attached direct to the rear axle housing.

The blade may be used in any position, right or left, from straight across to horizontal with the frame. It will ditch on either right or left side without changing the position of the blade on the hangers. It has a side shift of 36 inches and a blade clearance of about 18 inches when fully raised.

Other features of this new roller are a heavy-duty six-cylinder engine; a folding scarifier which, when raised, automatically folds up completely out of the way of all grader operations; dual steering, with hand or power instantly interchangeable; differential lock by means of pressure on a foot pedal; and direct-connected hydraulic control.

The manufacturer states that tests of this new-type grader have been so satisfactory that all previous models will be discontinued. The Superior No. 4 is now available in the 12,000-pound class but both smaller and larger sizes are being developed.

"We need this shovel's speed!"

★ says the Workman

RUSH is the order when repairs are made on lines of the New York Steam Corporation beneath the busy traffic of Fifth Avenue and 52d Street. So to Thomas Burke, workman, who was using Wood's new CLOSED-BACK Shovel on this rush job, Wood investigators put this question: "How do you like this improved shovel?"

"We need this shovel's speed!" said Thomas Burke.



Under actual working conditions Burke quickly discovered how the resiliency, better balance, lightness and strength of Wood's new CLOSED-BACK Shovels helped him to finish his tough job quickly. Buyers note the reasons for this efficiency, appreciate other advantages:

1. **The Closed-Back Shovel** combines stress-defying one-piece design, the unrivaled strength of the heat-treated shank, and an absolutely smooth back. No strap welds to pull loose.
2. **The Turned Shoulder** strengthens blade, saves shoes, makes shoveling easier.
3. **The Tapered Socket** gives strength and solidity where handle joins blade, fits the hand better.
4. **Heat Treating** makes the high-grade steels in Wood's "Moly," Big Fist, Wood and Stuart grades hard, to resist wear and last longer.
5. **Reduced Inventory:** The CLOSED-BACK Shovel supersedes strap weld, solid shank, and hollow-back shovels, makes it possible to cut your shovel inventory.



Buyers Beware: Wood's Engineers invented the CLOSED-BACK Shovel, developed the special welding process which fastens the CLOSED-BACK strip permanently without decarbonizing and weakening the blade. This is an exclusive Wood process, used on no other shovel.

Address The Wood Shovel and Tool Co., Piqua, O., U.S.A.

WOOD'S

Shovels · spades · scoops

In these famous grades... "Moly" (Molybdenum)... "Big Fist"... Wood... Stuart... Piqua

Prolonging the Life of Conveyor Belts

From the Chief Engineer's Desk of the *Link-Belt News* comes some helpful suggestions for the care of conveyor belts in order to prolong their life. These we are glad to pass on.

Belt Most Expensive Part

The belt is the most expensive part of a belt conveyor and should, therefore, be protected against injury and wear. If a belt is allowed to run improperly trained, its life will be greatly shortened and even the highest grade belt will be a disappointment. Conveyor belts usually run true for long periods, once they are properly trained.

When a belt runs out of line, the cause should be found and corrected immediately. Unless the belt runs true on the carrying and return idlers, the edges will wear off against the frames or other obstructions, the bottom of the belt is liable to injury by riding on the edges of the troughing idlers and in addition, the material will spill.

Conveyor belts should be trained while empty, and if they run out of line when loaded, it is probably due to uncentral or side loading. Correction of the loading chute is the preferable remedy.

Variations Caused by Material

Variations in wind pressure sidewise of the conveyor, or in the volume, sizes, percentage of lumps, and moisture content of the materials fed to the belt at different times may make it impossible to keep the loaded belt in alignment by means of either the supporting idlers or alterations to the loading chute. When varying materials cause the belt to be loaded more heavily on one side of its center line, the heavily loaded side seeks a lower level, thereby crowding the belt off-center with the idlers. Pivoted self-aligning idlers should be used for correcting these conditions.

Belts can not be made to run true by adjustment of take-up screws, or of the head pulley. Both head and tail pulleys should be set in alignment and kept so. All other training should be done by the idlers, or if possible, by correction of the loading chute.

Idlers at Work

The center roll of the troughing idlers must be in contact with the belt, for they steer or train the belt, unless the belt is over-plied or too stiff to assume the shape of the idlers when empty, and thus fails to make contact with the center roll.

Idlers should be kept square with the belt, and when training the belt by lining up the idlers, always work with the direction of belt travel. Stuck or sluggish idler rolls always tend to deflect the belt and cause unnecessary wear. Foundation or conveyor supports may be responsible for bad alignment

of belts, if not secure and rigid.

It is a mistake to try to train a belt by increasing the tension. This not only strains the driving mechanism but increases the horsepower requirements, puts an unnecessary stress on the belt, weakens the splice, reduces the troughing of the belt, and thus prevents the effective training action of the center idler rolls.

Trippers should be inspected regularly, to see that the belts do not scrape against the frame, and that the belt runs true over the pulleys of the tripper.

Self-Aligning Idlers

Self-aligning idlers resemble stationary idlers, except that they are pivotally mounted and swivel automatically when the belt is misaligned, thereby leading the belt and maintaining it central with the supporting idlers. These should not be used, however, while training a belt. Self-aligning idlers correct misalignment without harming the belt, thus saving the wear and tear which naturally follows continuous misalignment.

UNIVERSAL CRUSHERS

The Oldest Overhead Eccentric Type Crusher on the Market. Around It Are Built Many Combinations for Stone and Gravel



County, State and Contractor-owned Plants similar to this are contributing much to our road-building program and unemployment relief throughout the country.

Modern crushing equipments demand sturdy and dependable machinery that will produce larger quantities of stone and gravel speedily and economically.

THE OLD RELIABLE UNIVERSAL CRUSHER is the heart of more than fifty combinations with capacities up to 1500 tons in ten hours depending on the amount of oversize.

Write for details.

UNIVERSAL CRUSHER COMPANY

620 C Ave., West
Cedar Rapids, Iowa

GOING DOWN ...to stay

The use of structural steel for bearing piles is not new. Steel piles, driven 35 years ago and still in excellent condition, testify to the permanency and adequacy of rolled steel for this purpose. The recent introduction of CBP Sections, designed particularly for bearing pile service, has focused new interest on this use of steel. These sturdy, wide-flange sections offer a real solution where deep penetration is required or driving conditions are unusually severe. Ask for significant facts and figures we have developed on this important subject.

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CBP Sections are also furnished by ILLINOIS STEEL COMPANY • CHICAGO

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Learn why it's the fastest selling welder on the market today.

The Remote Control feature—at no extra cost, makes it a time saver and money maker on any job.

The new 40 Volt welding makes it the most practical welder for any job—no need for large—no need to install. Hobart is faster, costs less to operate. Ask us for your copy of "The Many Profitable Uses of Simplified Arc Welding." No obligation, write us today.

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One of the World's Largest Builders of Arc Welders

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Paving 6.97 Miles With Sand Asphalt

(Continued from page 26)

to use only 58 working days out of a total of 98 possible working days, excluding Sundays.

Laying the Hot Mix

The 6-inch forms were set 1 1/4 inches in the dirt for bearing so that with the 1/2-inch rail set on top for the finishing machine to run on there was space for the 5-inch sand asphalt pavement with a 3-inch base and a 2-inch top. The material was dumped on a 10 x 12-foot sheet metal dumping board pulled ahead by the trucks and shoveled from it to the grade. There were eight cutters for each shift who alternated on the loads with four for a load. The four rakers worked all the time during the shift. Then there was one back-surface or straight-edge man who did his work faithfully, for the pavement rode smoothly at 30 or 60 miles per hour. One man just ahead of the asphalt crew leveled off the subgrade, one man dumped the asphalt trucks as they came up and attached the dumping board, and there was a rail boy placing the strips of 1/2-inch metal on top of the forms for the Lakewood finishing machine with a special strike-off blade to run on, the machine operator and the foreman.

Two Buffalo-Springfield tandem rollers, an 8-ton steam roller and a 10-ton gas roller, rolled base and the subgrade roller was taken back when top was being run. This crew laid an average of 1,500 feet of base or 1,700 feet of top per 12-hour working day. The plant was rated as 500 tons but its average output under Alabama specifications was about 300 tons a day. It did, however, run as high as 420 tons in 12 hours.

Shoulders

The shoulders were dressed from the material cored out from the grading operations by the blade grader. The forms were left in place to give stability to the edge of the pavement until the shoulders had had time to solidify with grass.

Personnel

The contractor for this work was Sam E. Finley of Atlanta, Ga., for whom F. E. Bird was Superintendent. For the Alabama Highway Department V. A. Bates was Resident Engineer.

Test for Fuel Economy

A contest between gasoline and diesel tractors was recently held on a heavy-earth moving contract of the Porter-DeWitt Construction Co., road contractor of Kirkwood, Mo.

Three Caterpillar tractors were used in the test, two of them equipped with diesels and one powered by a gasoline motor. Costs records were closely kept by the owners and during a typical month's operation, the 60-hp gasoline tractor, pulling a blade scraper or scarifier, cost \$104.75 in gasoline. The two diesels of 83 and 56 hp, pulling heavy scoops with a combined capacity of 15

yards, consumed low-priced fuel costing only \$128.82, this amount being for both tractors.

Inasmuch as some variation in the numbers of hours existed, the contractor analyzed the per hour cost. For the gasoline tractor, this cost was 61 cents and for the diesels, 16 cents.

The diesel Seventy-Five consumed 3.72 gallons of fuel oil per hour while loaded with 12 yards of dirt. An average of 95 cubic yards per hour of pay dirt was moved by the outfit for 250 hours. The diesel Fifty, pulling a scraper, used 2 1/4 gallons of fuel oil per hour during 1,570 hours of operation in nine months.

Howes Joins Worthington

As a result of increased activity in its diesel and gas engine lines, Worthington Pump & Machinery Co., Harrison, N. J., has amplified the supervision of business in these lines in its eastern district by creating the Eastern

Oil Power Division under the field management of Ray L. Howes, with headquarters at Worthington's New York City office at 2 Park Avenue.

Howes, who is well-known in the diesel engine field, has for the past 22 years been connected with the diesel

sales division of Fairbanks, Morse & Co.

Through Worthington's field organization in the territories of the district offices of Boston, New York, Philadelphia, Washington and Atlanta, Howes will supervise diesel engine sales in these territories.

Good Roads CHAMPION HEATING KETTLES

Spreaders for

Stone Chips — Cinders — Sand

The "Autograder"

Drawn Graders — Road Drags

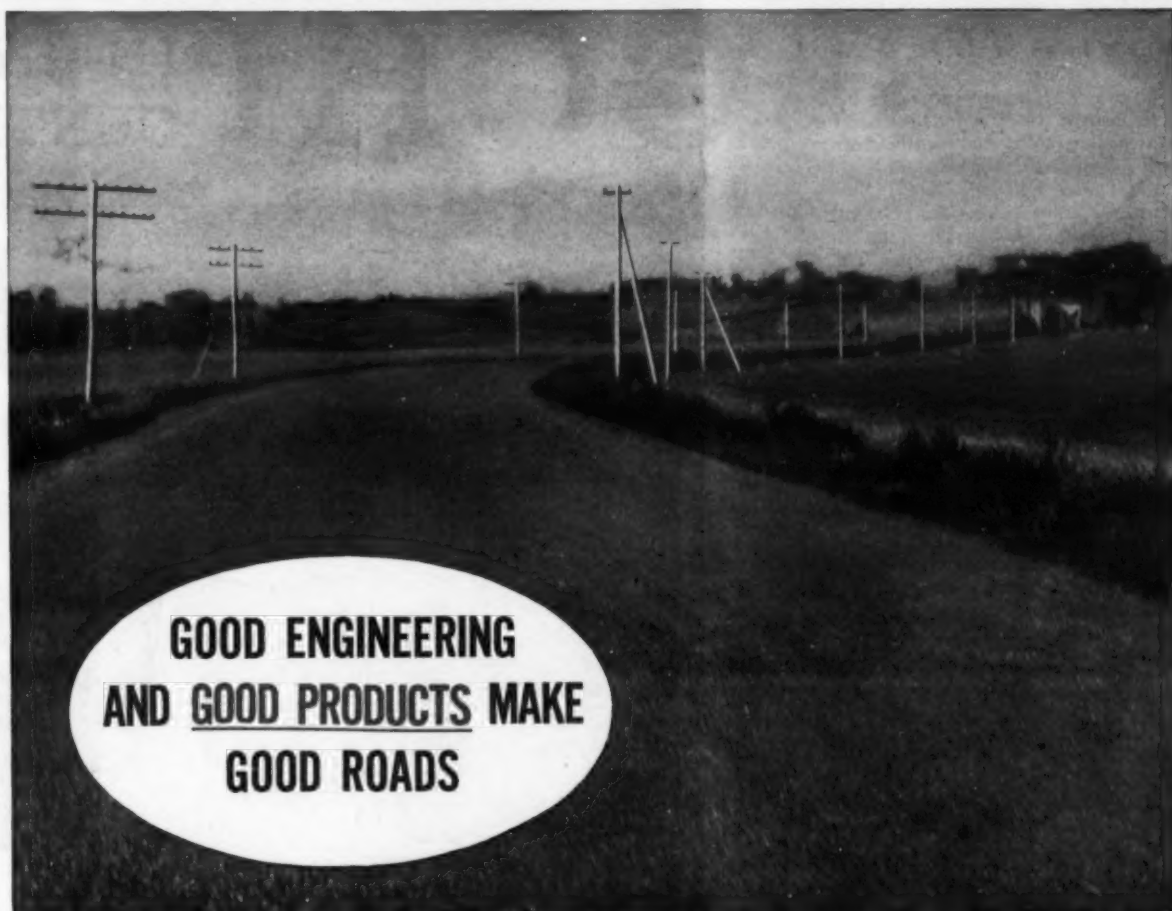
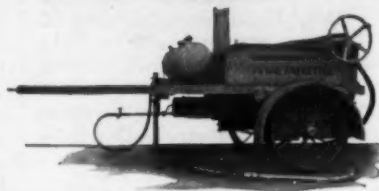
Champion & Climax

Rock Crushing Equipment

GOOD ROADS MACHINERY CORPORATION

KENNETT SQUARE

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**GOOD ENGINEERING
AND GOOD PRODUCTS MAKE
GOOD ROADS**

Constructed 1932 with Standard Priming Oil and R. C. No. 1, Socony Brand; sealed 1934 with Asphalt Emulsion, Socony Brand; Grand Isle, Vt.



Standard Asphalt Road Oils
Standard Asphalt Joint Fillers
Standard Waterproofing Asphalt
Standard Cut-Back Surfacing Asphalt
Standard Asphalt Binder A for surface treatment
Standard Refined Asphalt for sheet asphalt paving
Standard Cold Patch Asphalt for all types of patching
Standard Asphalt Binders B & C for penetration work (Asphalt Macadam)
Standard Paving Asphalt 51-60 and 61-70 Penetration for the mixing method (Asphaltic Concrete)
Standard Asphalt Emulsion for Surface Treatment, Penetration, Road and Plant Mix, and Patching
Specifications and all other particulars furnished on request.

CONCRETE VIBRATORS

ELECTRIC MOTOR OR GASOLINE ENGINE DRIVEN

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CHICAGO, ILLINOIS

SOCONY-VACUUM OIL Co.
INCORPORATED
STANDARD OIL OF NEW YORK DIVISION

Concreting Plant for Apalach. Bridge

(Continued from page 15)

bucket was replaced by a special 22-cubic foot Blaw-Knox bottom-dump concrete bucket, 14 feet long, with a roller gate and protection apron.

For unwatering the cofferdams and also for keeping them dry during the construction above the seal the contractor used one 10-inch Barnes centrifugal with a 24-hp Hercules engine; one 10-inch Morris centrifugal with a 24-hp Continental engine; one 6-inch centrifugal with a 10-hp motor; one Novo double diaphragm pump with a 2-cylinder engine; and eight Jaeger self-priming pumps with Wisconsin motors.

Yard Equipment

The yard equipment included the following for furnishing form work as needed and also for repairs to other equipment: one Fay & Egan table saw with 7½-hp Fairbanks-Morse engine; one National bolt machine; one standard navy diving outfit; one complete acetylene cutting and welding outfit; one Cameron 5B pump for barge bilge and furnishing water under pressure for washing the cofferdam walls before pouring concrete; one geared pipe threader; and one 2½-inch Typhoon centrifugal pump with a 6-hp Fairbanks-Morse engine on a well for water supply for the steam equipment. There was also a Moon steam turbine, Kohler and Homelite portable lighting plants, and a 100-cubic foot Ingersoll-Rand air compressor.

Personnel

The contract for the construction of the nine concrete piers of the Apalachicola Bay Bridge was awarded to the Hardaway Contracting Co., of Columbus, Ga., for \$137,336.20. For the contractor, Robert Hardaway, Jr., was Superintendent and for the State Road Department of Florida, E. S. Fraser was Project Engineer. W. S. Gudgell was Resident Engineer-Inspector for the Public Works Administration.

New Public Works Dept. Mgr. for Autocar Co.

The Autocar Co., of Ardmore, Pa., manufacturer of heavy-duty trucks, has announced the appointment of E. B. Sinclair as Manager of the Public Works Department, with headquarters at the Autocar Branch in New York City. Sinclair, who previously was connected with the Indiana truck organization and later was in charge of public works sales for Brockway, is well known to state, county and municipal officials throughout the East.

Boye Relected President of Asphalt Institute

At the annual meeting of the Board of Directors of The Asphalt Institute, representing four-fifths of the major producers of the United States and Canada, B. L. Boye was reelected President. Mr. Boye has been with Socony-Vacuum for 35 years and now heads that company's asphalt and fuel oil activities.

Other officers elected were: Vice Presidents, A. M. Maxwell, Standard Oil Co. of Ohio; Leroy M. Law, Shell Petroleum Corp.; J. A. Blood, Standard Oil Co. of California; and T. M. Martin, Lion Oil Refining Co. of Arkansas. W. W. McFarland, President of Warner-Quinlan Co., was reelected Secretary and Herbert Spencer, Standard of New Jersey, was reelected Treasurer. The Board of Directors renamed C. W. Bayliss, Barber Asphalt Co. to be Chairman of the Executive Committee, and elected McFarland, Martin and Blood

as the other committee members, Mr. Boye being a member ex-officio. J. E. Pennybacker continues as Managing Director.

The Institute announced the opening of a regional office in Cincinnati; additional offices are located in Washington, San Francisco, and Kansas City.

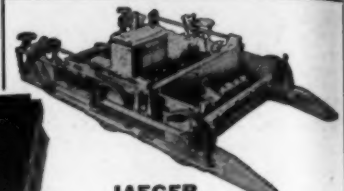
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GOHl Corrugated Pipe asks no favors. Wherever installed, Gohi Pure Iron-Copper Alloy Culverts, measured by any standard of performance, give value in service, dependability and satisfaction, many times beyond their cost.

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Gohi, the one culvert metal you can depend upon implicitly, is the accepted standard of quality for all highway drainage use.



Meets copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.

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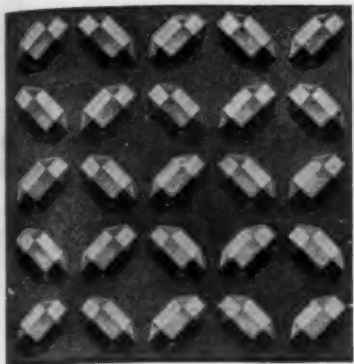
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Multigrip Floor Plate

Anti-Skid Floor Plate for Highway Bridges

Reducing skidding on highway bridges is a problem facing every state and county highway department. Multigrip floor plate, developed by Illinois Steel Co., Chicago, Ill., aims to provide maximum skid resistance regardless of the way the plate is laid or the angle from which it is approached. The design of the risers on this plate is such that there are no long surfaces on which to slide. The spacing is such that a tire tread is always in contact with several risers at right angles to one another. Thus, whether the plate is wet or dry there is proper resistance to sliding or skidding.

The risers are scientifically distributed and are flat on top so that they are comfortable for pedestrians to walk on. There are no gutters in which a thin tired vehicle wheel may catch. A wheel rolls on the risers, not between them.

When laid directly on old planking, Multigrip floor plate eliminates the need for complete reflagging and strengthens the entire bridge roadway. Such installations are claimed to reduce vibration and noise under traffic, eliminate the menace of rising spikes, and prevent damage to the roadway from anti-skid chains. Concentrated loads from heavy

trucks are distributed over greater areas, with consequent reduction in load stresses on the bridge floor.

Skyline Contract at Thornton Gap, Va.

The southerly of the three contracts now under way on the Skyline Drive in Virginia between Front Royal and Thornton Gap was awarded to Albert Bros. Contractors, Inc., of Salem, Va. on its bid of \$304,464.50, for the 9.7-mile stretch. This firm consists of three brothers, Charles, Archie and Lewis, and L. J. Messemmer who is Superintendent and Engineer. The contract calls for the excavating of approximately 300,000 cubic yards.

Included in the equipment for this work are two Lorain shovels, one gasoline-engine driven and the other diesel-engine driven, five Euclid crawler wagons, two Type 20 I-R portable compressors, one Type D I-R wagon drill,

six I-R jackhammers and a Type 40 I-R drill-steel sharpener.

The contract immediately north of this section operated by Sammons-Robertson Co. of Huntington, West Va., was described in the January issue of CONTRACTORS AND ENGINEERS MONTHLY. We are indebted to *Compressed Air Magazine* for the data on the Albert Bros. contract.

State Highway Buys Sixteen Maintenance Kettles

The North Carolina State Highway and Public Works Commission recently purchased from the E. F. Craven Co., equipment distributor, Greensboro, N. C., sixteen Model 84-HD Littleford tar and asphalt heating kettles for use in highway maintenance. These kettles, which are mounted on pneumatic rubber tires for easy portability, are equipped with a hand spraying attachment, making it a complete maintenance unit for shoulder work, penetration surfacing over small areas, and skin patching.



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with a
DETROIT MOTOR SCYTHE

- Here is the most economical and easily handled cutter on the market
- It goes anywhere, cuts anything, and enables one man to do the work of four or more with hand scythes.
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- It is now produced by a recognized leader among mower manufacturers and during over four years of service, thousands of users have enthusiastically testified to its dependability.

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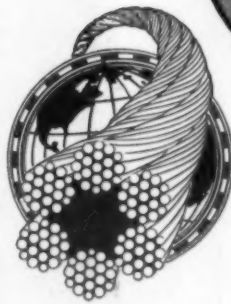
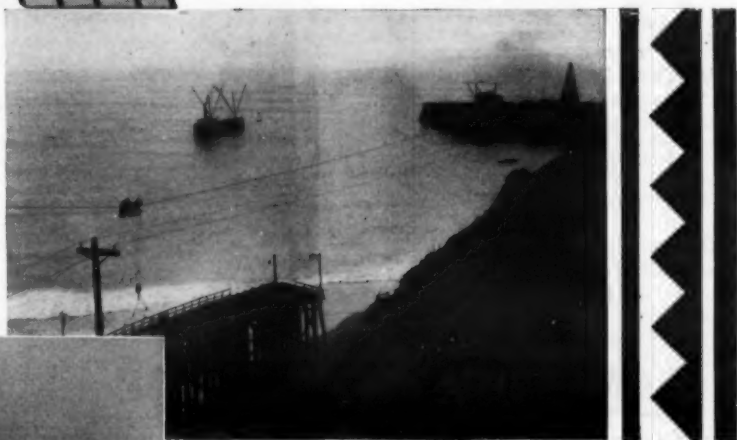


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Movie Shots Truck Book Free

351 Copies of the illustrated "Movie Shots" truck book, containing all the details of the 1935 Dodge and many striking photos of the Dodge in service are available free on request to those interested by writing direct to Dodge Div., Chrysler Motors, Dept. CEM-4, Detroit, Mich.

Fast-Acting Clamshell Bucket

352 The Williams Champion power-arm clamshell, a feature of which is the power-arm combination of lever and block-and-tackle, is described in literature which the Wellman Engineering Co., 7012 Central Ave., Cleveland, Ohio will be glad to send on request.

Screeding Black-Top or Concrete Roads

353 Flexible Road Joint Machine Co., Warren, Ohio, will be glad to send to interested contractors and engineers complete information on the Flex-Plane machine which will screed concrete and black-top roads 3 to 50 feet wide as well as install contraction joints in concrete roads.

Three-Cylinder Diesel Tractor

354 Caterpillar Tractor Co., Peoria, Ill., has announced the Caterpillar diesel Forty with a 3-cylinder diesel engine developing 44 horsepower at the drawbar and 49 horsepower on the belt. It will pull a 6 to 8-yard wagon and the frame is drilled for mounting all types of tractor equipment.

Street and Road Equipment

355 Chas. Hvass & Co., Inc., 508 E. 19th St., New York City, manufacturer of Hvass bituminous distributors, heavy-duty trailers, sand and chip spreaders, sweepers, sprinklers and heating kettles, will be glad to send complete information on any of this street and road equipment to interested contractors and engineers.

Complete Line of Drilling Tools

356 Catalog No. 983, a 48-page booklet describing and illustrating the complete line of Bucyrus-Armstrong drilling and fishing tools to meet the requirements of all kinds of drilling, may be secured free upon request from the Bucyrus-Erie Co., South Milwaukee, Wis.

Contractors' Automatic-Priming Pumps

357 G and R Never-Fail self-priming self-cleaning centrifugal pumping units with 100 percent automatic rapid prime by an entirely new method, in a variety of sizes and types, are described and illustrated in literature which the Gorman-Rupp Co., Mansfield, Ohio, will be glad to send on request.

Simplified Arc Welding

358 Copies of the booklet "The Many Profitable Uses of Simplified Arc Welding" as well as a complete description of the Hobart portable welder may be secured free by interested contractors and engineers from Hobart Bros., Box CE-55, Troy, Ohio.

Cableways and Scrapers for Dirt Moving

359 Sauerman Bros., 464 So. Clinton St., Chicago, Ill., will be glad to send to those interested complete information on its slackline cableways for underwater excavation and on Crescent scrapers for long range dirt moving.

Compressor with Improved Design

360 Gardner-Denver Co., Quincy, Ill., will be glad to send to those interested complete information on its new 6-cylinder two-stage, water-cooled air compressors, the unusual design of which is claimed to provide more delivered air, with a resultant saving in power cost.

New Hand Shovels

361 Wood Shovel & Tool Co., Piqua, Ohio, will be glad to send to those interested complete information on the new Wood Closed-Back shovel, among the features of which is the exclusive closed-back design.

Cutting and Welding Apparatus

362 The complete line of Milburn cutting and welding apparatus for all types of light and heavy work is described in literature which the Alexander Milburn Co., 1409 W. Baltimore St., Baltimore, Md., will be glad to send on request.

Oil, Tar and Asphalt Distributors

363 Complete literature and prices on any of the Etnyre oil, tar and asphalt distributors may be secured by interested contractors and highway department officials from E. D. Etnyre & Co., 400 Jefferson St., Oregon, Ill.

Trucks for Construction Jobs

364 General Motors Truck Co., Pontiac, Mich., will be glad to send to interested contractors and highway department officials complete information on GMC trucks, including the 47 important features in the design and construction of these trucks.

Complete Line of Road Rollers

365 Buffalo-Springfield road rollers, which are obtainable in sizes from 1½ to 17 tons, three-wheel or tandem, with scarifier and other attachments optional, are described in a catalog which Buffalo-Springfield Roller Co., Springfield, Ohio, will be glad to send on request.

Reliable Digging Buckets

366 Complete information on Hayward buckets which it is claimed will keep the job going ahead on scheduled time may be secured by interested contractors from the Hayward Co., 32-36 Dey St., New York City.

New 1935 Low-Price Trucks

367 Literature describing the new 1935 Ford V-8 truck, which has a number of new and improved features and is available with several body styles, may be secured by contractors, state and county highway officials from Ford Motor Co., Dearborn, Mich.

Placing Concrete by Vibration

368 Electric Tamper & Equipment Co., Ludington, Mich., will be glad to send to interested contractors and engineers in new literature describing Jackson high-frequency concrete vibrators for the Vibro-Cast method of placing concrete in structures, highways, etc.

Heavy-Duty ¾-Yard Shovel

369 Catalog 52-A describing the Bay-City Model 52 heavy-duty ¾-yard shovel which is readily convertible to dragline, crane, trench hoe and clamshell services, may be secured by interested contractors from Bay-City Shovels, Bay City, Mich.

Concrete Equipment

370 Miles complete line of concrete equipment is described in literature which the Miles Manufacturing Co., Jackson, Mich., will be glad to send to interested contractors on request.

DOWN GO YARDAGE COSTS

WHEN YOU USE

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That's why the contractors on the Jack Rabbit Trail—1,200,000 cubic yards of roadway excavation—chose LeTourneau Equipment, 30 units of it.

Precipitous slopes, tough grades as steep as 30% with an average of 11½%, huge fills—one requiring 175,000 cubic yards—cuts up to 185 feet, but LeTourneau Equipment is setting new dirtmoving records there, moving such yardages as this:

Working tandem, six 12-Yard Carryall Scrapers are delivering 65 pay yards per tandem unit per hour on a 4,000-foot round-trip haul.

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Ask our Engineers for further information—if you will write us, describing your dirtmoving problems, our Engineers will gladly advise you as to what LeTourneau Units are best fitted to your job.

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Manufacturers of Angledozer, Bulldozers, Buggies, Carryall Scrapers, Derricks, Rooters, Sheep's Foot Rollers, Power Control Units.

LeTourneau Bulldozers (left) bring down big yardages on the Jack Rabbit Trail. Loading the Buggy (below left) is easy—extreme care in spotting is unnecessary. Working tandem (below) takes no more power on the Jack Rabbit Trail, but ups the yardages and cuts the cost.



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Air Filters for Construction Equipment

371 Complete information on Air-Maze air filters for the engines of construction equipment, the use of which increases engine efficiency, may be secured by those interested from the Air-Maze Corp., 812 Huron Road, Cleveland, Ohio.

Dirt Moving Equipment

372 New literature describing Le Tourneau dirt moving equipment, including the Carryall scraper, buggies and bulldozers, has recently been issued by R. G. Le Tourneau, Inc., Stockton, Calif., who will be glad to send copies to contractors and highway engineers on request.

Low-Priced Trucks

373 Complete information on Chevrolet low-priced trucks, which are built to handle hauling jobs day after day at small operating cost, may be secured by interested contractors and highway department officials from Chevrolet Motor Co., Detroit, Mich.

A New Signal Torch

374 The new Storm King signal torch, with a number of new features and improvements, tests of which show it will burn in a 68-mile gale, is described in literature which the Shanklin Mfg. Co., Springfield, Ill., will be glad to send to contractors and highway engineers on request.

Grinders for Rock Bits

375 Quick-Way grinders for detachable rock bits, which are made in two sizes, Model G of which it is claimed will resharpen bits in two to four minutes, are described and illustrated in literature which the C. H. Carlsson Mfg. Co., 13-15 Main St., N. E., Minneapolis, Minn., will be glad to send on request.

Special Washers and Stampings

376 A new handbook entitled "Special Washers and Stampings," listing over 19,000 shapes, sizes and specifications of washers, stampings, and related items used in construction, has recently been brought out by the Wrought Washer Mfg. Co., 2100 S. Bay St., Milwaukee, Wis. Copies may be secured by readers of this magazine direct from the company.

Convertible Shovels, Cranes, Draglines

377 Bulletin No. 72, describing and illustrating Orton Unit-Cast convertible shovels, draglines and cranes, which are available in various capacities and are built for the heaviest type of excavation and material handling, may be secured by interested contractors from the Orton Crane & Shovel Co., 608 So. Dearborn St., Chicago, Ill.

What You Should Know About Wire Rope

378 This is the title of a 20-page booklet describing and illustrating the construction and uses of Flex-Set preformed Yellow Strand wire rope. Copies of this hand book for wire rope buyers may be secured by those interested from the Broderick & Bascom Rope Co., St. Louis, Mo.

Time Locking Device for Asphalt Mixers

379 A new all-mechanical time locking device for asphalt mixers, which is a complete self-contained unit mounted on one side of the mixer and which also locks the mixer gate valve from the time the aggregate is introduced to the mixer until the batch is discharged, is described in Bulletin TL-12 which Hetherington & Berner, Inc., Indianapolis, Ind., will be glad to send on request.

Two-Stage, Air-Cooled Compressors

380 Bulletin 758, issued by Chicago Pneumatic Tool Co., 6 E. 44th St., New York City, describes the new C-P line of two-stage, air-cooled portable compressors with 6-cylinder gasoline engines, or diesel engines if desired, and with various mountings, the whole being designed for greater economy.

Features of New Crushing Plant

381 The Diamond 1935 Model No. 65 portable crushing and screening plant which incorporates all the features of previous models with many additional new refinements is described in literature which Diamond Iron Works, Inc., Minneapolis, Minn., will be glad to send on request.

Truck Operators' Handbook Free

382 The 1935 "Operators' Handbook" containing information on various kinds of industrial tires, including the factors governing their selection, and a load and service diagram, is available to all those interested in tire performance. Write to the B. F. Goodrich Co., Akron, Ohio.

Electric Equipment for Power Shovels

383 This is the title of a 20-page booklet describing and illustrating G-E electric equipment for power shovels, copies of which may be secured by interested contractors from the General Electric Co., Schenectady, N. Y.

Changes in Personnel of Robert W. Hunt Co.

Robert W. Hunt Co., Engineers, conducting a national and international engineering inspection, testing and consultation service, with general offices in Chicago, has accepted the resignation of C. B. Nolte, President, who has accepted the presidency of the Crane Co. of Chicago.

James C. Ogden, formerly Vice President in charge of the company's eastern and foreign activities at New York, succeeds Mr. Nolte as President. Mr. Ogden has been actively engaged in the organization for the past thirty-five years and has served in an executive capacity since 1908. F. M. Randlett, Pacific Coast Manager since 1926, will assist Mr. Ogden as Vice President and General Manager.

Robert W. Hunt Co. was organized by Captain Robert W. Hunt and associates in 1888 and has been identified with private and governmental transportation and construction work throughout the world.

Soil Erosion Control

One of the most pertinent and discussed problems today is that of soil erosion, the effects of which are being felt in almost every part of the country. There are two general types of erosion, sheet erosion and gullying, both of which can be controlled.

Bulletin 1383 of the Austin-Western Road Machinery Co. describes the various methods for preventing soil erosion and the Austin-Western equipment designed for this purpose, including terracers, blade graders, elevating graders, trail builders, rip-rooters, scrapers and plows.

Copies of this 16-page illustrated bulletin may be secured gratis by those interested from the Austin-Western Road Machinery Co., Aurora, Ill.

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FOR EVERY
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• Electric power for tools and for every construction need—where you want it, when you want it—that's what the F-M Model "36" Diesel engine-generator unit offers every contractor.

No matter where the job may be—far beneath a city street or along a levee miles from established power facilities—you can now generate your own current for tools, lighting and a hundred other purposes, at a fraction of the cost. Light in weight, readily portable, this simple fool-proof power unit burns low cost fuels with complete Diesel efficiency, furnishing power as you need it without fussing or attention.

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JAEGER "SURE PRIME" PUMPS

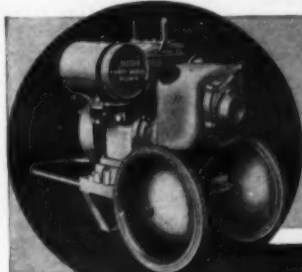
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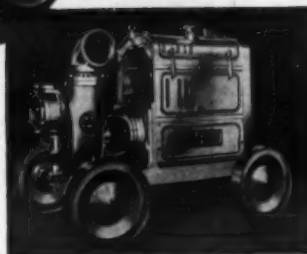
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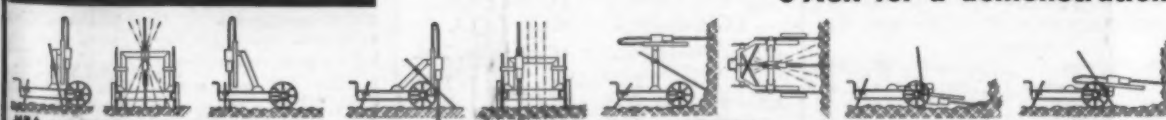
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Drake-Williams-Mount—"Omaha" Dragline Buckets
General Excavator Co.—Shovels
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BROWNING—Truck Cranes, Shovels, Locomotive Cranes
EYER—Crawler Shovels and Cranes
OWEN—Clamshell Buckets
OMAHA—Dragline Buckets
WHITCOMB—Gasoline, Diesel, Electric Locomotives
A. LESCHEN & SONS—Wire Rope
MCKERNAN-TERRY CORP.—Pile Drivers
LAMBERT-NATIONAL—Hoists and Cableways
DIAMOND IRON WORKS—Crushers and Portable Gravel Plants

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SHEPHERD TRACTOR & EQUIP. CO.

150 W. Jefferson St. Los Angeles, Calif.

Distributors for

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LE TOURNEAU—Carroll Scrapers, Angle Dozers, Bull Dozers, Rotters, 25-Yd. Wagons
WILLAMETTE—Hoists and Winches
KILLEFER—Scrapers, Road Discs and Rotters
DAVEY—Air Compressors
ATHEY—Track Wagons and Truss Wheels

SMITH BOOTH USHER CO.
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BARBER-GREENE—Ditchers, Excavators, Loaders
CEDAR RAPIDS—Crushers
CLEVELAND—Crawlers
CLEVELAND—Rock Drills
CLYDE—Hoists
EASTON—Industrial Cars
FREEMAN—Turntables
GALION—Graders, Rollers
H O U G H-UNIVERSAL—Sweepers
HYPERBURE JENNY—Cleaners
JAEGER—Mixers, Hoists, Pumps, Tower Equipment
JEFFREY—Locomotives, etc.
JOHNSON—Bins, Batches

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Adams Black Top Pavers
Barber-Greene Tractors
Brennels Shovels, Cranes
CLEVELAND Rock Drills
CLEVELAND Tractors
Dobble Derricks
Erie Trenching Rollers
Freeman Turntables
Hercules Power Units
Hyperbure Jenny Cleaners
Hough Sweepers
Huber Road Rollers
Interstate Tramway
Iowa Crushers, Roadmix Pl.
Jasper Mixers, Hoists, Pumps
Johnson Bins, Batches
Jones Saw Benches
Kaiser Snow Plovers
Lakewood Road Finishers
Lynch Chuting
McKernan-Terry Pile Drivers
Multi-Foot Pavers
Northern Conveyors
Page Dragline Buckets
Sacramento Oil Distributors
Schramm Compressors
Sun Ray Traffic Signals
Templeton, Kesty Braces, Jacks
Tolide Torches
Union S-T Hd. Winches
Walter Four-Wheel Dr. Trucks
Wehr Motor Graders
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MINN. STL. & MACHY. CO.—Twin City Engines, parts
HANSON CLUTCH & MACHY. CO.—Full Revolving Shovels, Cranes, Draglines, 4, 6, and 8-yd.
KEYSTONE DRILLER COMPANY—Excavating Machines, Shovels, Cranes, Draglines, Pull-Scopes, Skimmers, Plunger Shovels, Pavement Breakers
DAVIS COMPANY—Large Tilting Mixers, 1, 2, 3, and 4-yd., Weigh Batches, Batching Plants, Manual or Full Automatic Operation, Ready-Mix Concrete Plants and Equipment, Motor Truck Concrete Mixers and Carriers, Electrically Operated and Controlled Water Meters, Rock Silos, Bins, Bunkers, Hoppers, Bunker Gates, Chutes
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Representing
Austin Machinery Co.
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Brookville Locomotive Co.
Byers Machine Co.
Chas. Olin Co.
Cousens & Co., Inc.
Domestic Engine & Pump Co.
E. I. du Pont de Nemours & Co.
Dobble Fdy. & Machine Co.
Duff Mfg. Co.
A. B. Farquhar Co., Ltd.
Harrington Co.
Lidgerwood Mfg. Co.
Pulmonator Steam Pump Co.
Ransome Concrete Mach. Co.
Richmond Sewer Anchor Co.
Sterling Wheelbarrow Co.
Templeton, Kesty & Co.
Tide Galvan Iron Wks. & Mfg. Co.
Union Iron Works
Universal Road Machy. Co.

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Cyrone Femo Co.
The Elgin Corporation
E. D. Ely & Co.
De Walt Products Co.
Iowa Mfg. Co.
Chas. Hyatt & Co., Inc.
Littlefield Brothers
Rawls Mfg. Co.
Pape Engineering Co.
Freeman Mfg. Co.
Hough-Universal Road Sweepers
Allis-Chalmers Mfg. Co.
Ames-Baldwin-Wyoming Co.
Clemens-Bronks Co.
Coffing Hoist Co.
Jaeger Machine Co.
Sullivan Machinery Co.
Tuthill Spring Co.
Waukegan Motor Co.

R. S. ARMSTRONG & BRO. CO.
676 Marietta St. Atlanta, Ga.

Representing
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AMES-BALDWIN-WYOMING Shovels, Scoops
BEEBE Hand Hoists
BUTLER Bins
CARGIC Lights
CHICAGO PNEUMATIC Air Compressors
DOMESTIC Pumps
EMERSON Pumps, Valves
GALION Road Machinery
GENERAL ELECTRIC Motors
JAEGER Concrete Mixers
JONES-SUPERIOR Saw Rigs
LAKEWOOD Road Mach. Handling Equipment
LE ROI Engines
LIDGERWOOD Hoists
OWEN Buckets and Winches
SKILSAW Portable Electric Saws
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UDENHOLM Drill Steel
WATERLOO Bar Benders
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"CATERPILLAR" Tractors, Graders, Power Units, etc.
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BLAW-KNOX Forms, Bins, Buckets, Batches, etc.
BARBER-GREENE Ditchers, Conveyors, Loaders
HYABS Asphalt Distributors, Sweepers, Sprinklers
LITTLEFORD Asphalt Trucks, Kettles
MUNDY Hoisting Equipment
BUFFALO-SPRINGFIELD Road Rollers

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BATES—Wire Ties, etc.
BEEBE BROS.—Hoists
INGERSOLL-RAND—Air Compressors and Tools
JONES-SUPERIOR—Portable Gas & Elec. Power Saws
LEACH—Concrete Mixers and Tower Equipment
INSLEY—Concrete Towers, Chuting, Cranes, Shovels, Choker Hooks
McKernan-Terry—Pile Drivers, Extractors, Lambent-National—Hoists, Cableways
Steel & Condit—Special Machinery
Wheelbarrows, Concrete Carts, Hose, Cable, Rope, etc., carried in stock

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122 So. Michigan Ave. Chicago, Ill.

Representing
KOEHRING COMPANY—Mixers, Pavers, Cranes, Shovel Dumpers, Mud Jacks
KWIK-MIX COMPANY—Concrete and Bituminous Mixers
C. H. & E. MFG. CO.—Pumps, Saw Rigs, Hoists
GORMAN-RUPP CO.—Self-Priming Centrifugal Pumps
MICHIGAN POWER SHOVEL CO.—Crawler Shovels, Cranes, Truck Shovels, Cranes, 3/4-yard
PARSONS COMPANY—Trench Machines, Turbo Mixers
LE ROI COMPANY—Air Compressors
LITTLEFORD BROS.—Distributors, Tar Kettles, Heaters, Torches
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Representing
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Universal Crane Co.
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Construction Machinery Co. Elev. Tamping & Eq. Co.—Mixers, Saw Rigs, etc.
Foots Company, The—Concrete and Black-Top Pavers
Independent Pneu. Tool Co.—Air Tools
Byers Mach. Co.—Cranes, Shovels, Draglines, etc.
Sobram, Inc.—Air Compressors, Tools
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A Complete Line of Construction Tools and Equipment Carried in Chicago. Tel.: Crawford 6290

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Gardner-Denver Co.
The Frank G. Hough Co.
Killer Mfg. Corp.
LaPlant-Choate Mfg. Co.
R. G. LeTourneau, Inc.
Speeder Machinery Corp.
Williamette-Hyster Co.
Wisconsin Foundry & Machine Co.

Telephone 6177

BOWMAN-RALSTON TRACTOR & EQUIPMENT CO.
401 E. Florida St. Evansville, Ind.

Representing
Athey Truss Wheel Co.
LaPlant-Choate Mfg. Co.
Baker Manufacturing Co.
Thew Shovel Company
Killer Manufacturing Co.
Schramm, Inc.—Compressors
Williamette-Ersted Co.—Hoists
Pioneer Gravel Equip. Mfg. Co.
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INDIANA EQUIP. CO., INC.
327-329 West Market St., Indianapolis, Ind.

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BARBER-GREENE CO.—Loaders and Conveyors
BUFFALO-SPRINGFIELD—Rollers
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"CATERPILLAR"—Tractors
EUGLIO—Wagons, Scrapers, Bulldozers
GENERAL—Shovels and Cranes

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GIERKE-ROBINSON CO.
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Representing
BLAW-KNOX—Steel Road, Curb and Gutter Forms, Bins, Batches, Clamshell Buckets, Truck Turntables, Ord Concrete Road Finishers
CHAIN BELT—Mixers, Pavers, Pumps, Saw Rigs, Conveyors, Elevators
CLYDE—Gasoline and Steam Hoists, Derricks
HOUGH-UNIVERSAL—Sweepers
SULLIVAN—Air Compressors, Tools
TRACKSON—Crawlers, Shovels and Bulldozers
THEW-LORAIN—Cranes, Shovels, Draglines
TIMKEN—Detachable Rock Bits, Steels
UNIVERSAL—Truck Cranes
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THOMAS L. BARRET
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C. H. & E. Pumps and Contractors Equipment
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HAISS Loaders and Material Handling Equipment
ARMSTRONG Blast Hole Drills
UNION Hammers and Concrete Buckets
HUG Trucks, Turntables and Subgraders
MUNDY Hoisting Engines
VULCAN Locomotives
METAFORM Road Rails, Wall Forms, etc.
"CAMEL" Automatic Tractor Dump Wagon
KENNEDY Gearless Crushers
CORRUGATED Bar and Mesh Reinforcement
BARRET Asphalt Expansion Joint
RUSSELL Scrapers, Drags
BAY CITY Shovels, Cranes
LA CROSSE "Tu-Way" Trailers
CEDAR RAPIDS Portable Crushing, Screening & Loading Plants
HERCULES Road Rollers.

Brandeis Machinery & Supply Co.
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Blaw-Knox Co.
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Cameron Steam Pump Works
Chicago Wheelbarrow Scale Co.
Cleaver-Brooks Co.
Clyde Sales Company
The Deming Company
E. I. du Pont de Nemours & Co.
A. B. Farquhar Co.
Ingersoll-Rand Co.
Indley Mfg. Co.
International Harvester Co.
A. Leschen & Sons Rope Co.
McKernan-Terry Corp.
M & M Wire & Lamp Co.
National Equip. Corp.
Quick Way Tr. Shovel Co.
Rogers Bros. Corp.
Saggen Derrick Co.
Sauerman Bros.
Smith Engineering Works
Sterling Wheelbarrow Co.
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Jaeger Machine Co.
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Barnes Manufacturing Co.
Barnes Compressor Co.
Hardsong Wonder Drill Co.
Chicago Automatic Conveyor Co.
Northwest Engineering Co.
Euclid Crane & Hoist Co.
Athey Truss Wheel Co.
LaPlant-Choate Mfg. Co.
Good Roads Machine Corp.
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D-A Lubricants
DuPont Explosives
Dobble Derricks
Elastic Expansion Joint
Farquhar Engines, Boilers
General Electric Motors
Gulf States Reinforcing
Steel
Hansen Excavators
Hauke Heaters and Thawers
Johnson Bins and Hoppers
Lidgerwood Hoisting Machy.
Lincoln Electric Motors
Link-Belt Electric Counter-Weight Bar Tie
Leffel Gas Engines
Northwest Shovels, Cranes
New Pumps and Hoists
Oxoid Apparatus
Page Buckets
Rogers Bros. Trailers
Saggen Derrick Co.
Shunk Grader Blades
Teledyne Torches
Trackson Tractors
Universal Contr. Accessories
Vulcan Pipe Equipment
Wehr Graders
Western Road Machinery
Worthington Pumps
Wyoming Shovels

Equitable Equipment Co., Inc.
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BROWNING Cranes and Pumps
CAMERON Centrifugal Pumps
CEMENT GUN Gunting and Equipment
CUMMINS Diesel Engines and Pumps
DEAN Bros. Steam and Power Pumps
EDGE MOORE Water Tube Boilers
GENERAL ELECTRIC Motors, Arc Welders, etc.
HYDROLIC Goulds Oil Purifiers
INGERSOLL-RAND Air Compressors, Pneu. Tools, Pumps, Engines
INTERNATIONAL Nickel, Monel Metal, Inconel
MERRELL Pipe Machines
MOORE Steam Turbines, Reduction Gears
MORRIS Dredging Machy.
MUNDY Hoisting Engines
NOVO Engines, Hoists, Pumps
PLYMOUTH Gas and Diesel Locomotives
SHAW BOX Hoists, Cranes
SMITH Concrete Mixers
STEPHENS-ADAMSON Contractors
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WEIR-KILBY Frogs
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WELDING Rods Equipment

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CLYDE Hoisting Engines and Derricks
FREEMAN Turntables
GALLION Graders, Rollers
LE ROUX Portable Air Compressors
LE ROUX Engines
LINK-BELT Draglines, Cranes and Shovels
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Beaumont-Birch Co.
Dobbin Fdy. & Mach. Co.
Electric Tapper & E. Co.
Erie Steel Construction Co.
Hercules Motors Corp.
Huber Mfg. Co.
Ingersoll-Rand Co.
Iowa Mfg. Co.
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Representing

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INSLEY Towers and 1/2-yard Shovels
PARSONS Trenching Machines, etc.
McCORMICK-DEERING Industrial Tractors
C. H. & E. Saw Rigs, Hoists, Pumps
KWIK-MIX Mixers
RIDDLE Power Grader and Demountable Bins

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Cleaver-Brooks Company
Cleveland Formgrader Co.
Huber Mfg. Company
Insley Mfg. Company
Koehring Company
Kwik-Mix Mixer Co.
Lidgerwood Mfg. Company

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"CATERPILLAR" Road Machinery
"CATERPILLAR" Combine Harvesters
GENERAL Excavators
GRAVELLY Power Motors, Pumps
KILFEE Tillage Tools
LINK-BELT Shovels & Cranes
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CLEVELAND ROCK DRILL CO.
BARNES MFG. COMPANY
LA PLANT-CHOATE MFG. CO.
SABCOCK MFG. CO.
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BAKER MANUFACTURING CO.
ROTARY SNOW PLOW CO.
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REX-WATSON CORPORATION
DAVEY AIR COMPRESSOR CO.
BLAW-KNOX Bulldozers, Dirtmovers

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THOMAS G. ABRAMS, INC.

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Representing

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Brookville Locomotive Co.
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Butler Bin Company
Burch Corporation
Byers Machine Co.
Domestic Engine & Pump Co.
LeRo-Rix Compressors
St. Regis Paper Company
Saugen Derrick Company
Smith Engineering Works
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Le TOURNEAU - DIRT Moving, Road Equipment
KILFEE-Road Rippers, Scrapers
ATHEY-Crawlers, Dump Wagons, Trailers
BUCHUS-ERIE - Power Shovels, Cranes, Draglines
PIONEER-Crusher, Gravel Plants
REX-Mixers, Pavers, Mott-Mixers, Pumps, Saw to-Mixers, Batches
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Complete Plants Rented

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Owen-Clamshell Buckets
Hauk-Heaters
Saugen-Derricks & Winches
Skilaw-Electric Saw, Drills
Skilaw-Shovels
Lewiston-Engines
Symons-Column Clamps
Winlow-Weighing Scales
Universal-Form Clamps
Link-Belt-Cranes, Shovels, Draglines
Novo-Pumps

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Insley Mfg. Co.
Parsons Co.
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Saugen Bros. Inc.
Allis-Chalmers Mfg. Co.
Gardner-Denver Co.
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Labour Co., Inc.
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Blaw-Knox Company-Finishing machines, road farms, bins, batches and buckets
Bucyrus-Erie Company-Shovels, cranes, draglines
Chain Belt Co.-Mixers, pavers, pumps
Caterpillar Tractor Co.-Tractors, graders, road machinery
D-A Lubricant Co.-Lubricants
Dittler Mfg. Co.-Hercules spreaders
Gardner-Denver Co.-Air compressors and tools
Kilflee Mfg. Corp.-Road and farm tools
LaPlant-Choate Mfg. Co.-Bulldozers, backfillers, wagons, snow plows
A. Leach & Sons Rope Co.-Wire rope
E. D. Etnyre & Co.-Oil and tar distributors and heaters
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Iowa Manufacturing Co.
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Whitcomb Locomotive Co.
Butler Bin Co.
"Williams"-Buckets and Trailers
Slusser-McLean Scraper Co.
Ames Baldwin Wyoming Co.
MacWhitty Co.
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ROGERS BROS.-Trailers
HUMPHREYS-Pumps
MILWAUKEE-Gasoline Locomotives
McLANAHAN & STONE-Crushers, Screens
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Asphalt and Rubber Expansion Joint
Road Building Materials

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GOOD ROADS-Crushers
LITTLEFORD-Asphalt
Heater, Distributors
BURCH-Spreaders
JONES-Saw Rigs
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TIMKEN-Detachable Rock
Machinery
HILYARD-NEWBOLD-
Hot or Cold Asphalt Mix-
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Lakewood Engineering Co.
Northwest Engineering Co.
Sullivan Machinery Co.
Pioneer Gravel Equipment
Mfg. Co.
Butler Bin Company
Clyde Sales Company
Gallion Iron Works
Page Engineering Co.
American Steel & Wire Co.
Burch Corporation
Reed Snow Plows
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Blaw-Knox Co.
Chain Belt Co.
Dayton-Burns Grip & Shere Co.
C. R. Jahn Co.
Koehering Machinery & Conveyor Co.
Kob Manufacturing Co.
McKinnon-Terry Corp.
Northwest Engineering Co.
R. B. Equipment Mfg. Co.
Sullivan Machinery Co.
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Pioneer Gravel Plant Equip.
Bucyrus-Erie Shovels, Draglines and Cranes
Bucyrus-Erie Loadmasters
Buckeye Ditchers, Backfillers
Buffalo-Springfield Road Rollers
D-A Lubricants, Oils
Hewitt Bellows, Hose
Tractor-operated Hoists, Scrapers, Dirtmovers, Rippers, Scarifiers, Bulldozers, Trailers, Batches, Snow Plows, Loaders, Track-type and Wheeled Wagons and Trailers, etc.

Member: Associated Equipment Distributors

THE HENRY H. MEYER CO.

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628 Munsey Building, Washington, D.C.

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Bates & Lockport Bl. Co.
Byers Machine Co.
Phillips Carey Co.
Chas. O. Burner Co.
Comery & Co., Inc.
Domestic Eng. & Pump Co.
Dobbin Fdy. & Mach. Co.
Duff-Norton Mfg. Co.
Salem Iron Wks. & Mfg. Co.
A. B. Farquhar Co., Ltd.
Harrington Co.

Member: Associated Equipment Distributors

E. K. S. EQUIPMENT CO.

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Representing

ALLIS-CHALMERS-Tractors, Graders, Wagons, Power Units
BERG-Concrete Finishers
CLEVELAND-Air Tools
DIAMOND-Crushers, Gravel Plants, Washing Equipment
FLEXIBLE-Road Joint Machinery
FOUR-WHEEL DRIVE-Trucks
HETZEL-Forms, Bins, Batches
HOUGH-UNIVERSAL-Road Sweepers
HUBER-Rollers

Member: Associated Equipment Distributors

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3942-46 W. Pine Blvd., St. Louis, Mo.

Representing

DETROIT HOIST & MACH. CO.-Air and Electric Hoists
BUCKEY TWIST DRILL CO.-Twist Drills and Reamers
BUHL CO.-Portable Air Compressors
CHAMPION RIVET CO.-Rivets and Welding Rod
DETROIT HOIST & MACH. CO.-Air Hoists
HARDSCOPE WONDER DRILL CO.-Rock Drills, Paving Breakers
W. H. KELLER, INC.-Super Pneumatic Tools
PENNSYLVANIA-Air Compressors and Pumps
DAVID ROUNDT & SON-Chain Hoists
RIVET CUTTING CO.-Steel Busters
N. A. STRAND & CO.-Flexible Shaft Equipment
UNION-Portable Woodworking Tools
VANDORF-Electric Drills, Grinders, Buffers
VICTOR-Welding and Cutting Tools
WESTINGHOUSE-Arc Welding Equipment
GUSTAV WIEDEKE & CO.-Tube Expanders

MIDLAND IMPLEMENT CO., Inc.

Billings Montana

Representing

FORDSON-Tractors and Industrial Equipment
BARBER-GREENE-Conveyors, Ditchers and Loaders
DIAMOND IRON WORKS-Gravel Equipment
BRENNER-Rippers and Scarifiers
WOOD-Wire Snow Fence
HYSTER-Hoists and Winches
LANSHING-Scrapers, Frames and Barrows
SCHRAMM-Compressors
WHEELING CORRUGATING CO.-Metal Culverts
KOEHRING-Shovels, Drag Lines and Concrete Mixers
INDUSTRIAL & TRUCK FLAKES
BRODERICK & BASCOM WIRE ROPE CO.-Wire Rope and Cable
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NO-NOT CABINS IN A FLOODED AREA, BUT THE CAISSONS FOR A PIER OF THE APALACHICOLA BAY BRIDGE, FLA. WITH TARPULIN TOPS TO KEEP OUT THE SQUALLS
SEE PAGE 1



THE FIRST 801 TO OPERATE IN SOUTHERN CALIFORNIA. A 2-YARD SHOVEL WORKING ON SECTIONS 20-23 OF THE COLORADO RIVER AQUEDUCT AWARDED TO GRIFFITH CO. OF LOS ANGELES
SEE PAGE 14



A PONTOON SECTION AND DELIVERY FROM THE 18-INCH PIPE FROM THE WILBANKS & PIERCE DREDGE 'MANATEE' WIDENING FILL ON U.S. 90 IN THE KINGDOM OF THE KINGFISH
SEE PAGE 2



SETTING FORMS FOR SAND-ASPHALT PAVING NEAR MOBILE, ALA., SAM E. FINLEY OF ATLANTA, GA., CONTRACTOR
SEE PAGE 5



HAND LABOR SHOVELING HOT MIX FROM A STEEL DUMPING BOARD TO THE ROAD, AND A FINISHING MACHINE SPREADING THE MATERIAL ON SAM FINLEY'S 6.97-MILE CONTRACT ON ALABAMA 42
SEE PAGE 5



GENERAL VIEW OF AGGREGATE STORAGE, BATCHING PLANT AND HEAD TOWER OF CABLEWAY WITH CEMENT SILO BACK OF TOWER, BONNEVILLE, ORE.
SEE PAGE 2



A 75-B OWNED BY STROM CONST. CO., LOADING A CRAWLER WAGON HAULED BY AN A-C MODEL L TRACTOR NEAR WALKER, CASS COUNTY, MINN.